OMRON

Smart Sensors

Laser Displacement Sensors CMOS Type

ZX2 Series



User's Manual





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understanding of the product.

engineering.

necessary.

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Thank you for purchasing the ZX2 Series Smart Sensor. This manual provides information regarding functions, performance and operating methods that are required for using the sensor.

The ZX2 Smart Sensor must be operated by personnel knowledgeable in electrical

To ensure correct use, please read this manual thoroughly to deepen your

Please keep this manual in a safe place so that it can be referred to whenever

When using the ZX2 Smart Sensor, make sure to observe the following:

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Warranty, Limitations of Liability

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	Meanings of Signal Words				
CONTENTS	The following signal words are used in this manual.				
INTRODUCTION	^		Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in		
PREPARATION For Measurement		NING	serious injury or death. Additionally there may be significant property damage.		
FLOW OF OPERATION					
BASIC		N	Meanings of Alert Symbols		
	The following a	lert symbols	s are used in this manual.		
MAIN APPLICATIONS & SETTING METHODS					
Height		Indicates	the possibility of laser radiation.		
Steps and Warpage					
Double Sheet Detection	Indicates prohibition when there is a risk of minor injury from electrical shock or other source if the product is disassembled.				
Thickness	<u> </u>				
Positioning					
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Laser Safety		CONTENTS
Sensor Head ZX2-LD50L, LD50, LD100L, LD100: Class 2		
		PREPARATION For Measurement
Never look into the laser beam. Doing so continuously will result in visual impairment.	^	FLOW OF OPERATION
		BASIC SETUP
Do not disassemble the product. Doing so may cause the laser beam to leak, resulting in the danger of		MAIN APPLICATIONS & SETTING METHODS
visual impairment.		Height

Sensor Head ZX2-LD50V: Class 1

Do not disassemble the product.

Doing so may cause the laser beam to leak, resulting in the danger of visual impairment.



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and Warpage Double Sheet

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In Europe, diffuse-reflective models in the ZX2 Series are categorized as Class 2 laser products and the regular-reflective model is classified as a Class 1 laser product according to EN60825-1 (see note).

In the U.S.A., diffuse-reflective models in the ZX2 Series are categorized as Class II laser

products, and the regular-reflective model is classified as a Class I laser product according to IEC60825-1 criteria, in accordance with the stipulations of the FDA standard

This product has already been registered with the CDRH (Center for Devices and

The ZX2 Series is meant to be built into final system equipment. Pay special attention to

The CE markings on the products also reflect these categorizations.

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SETTING TRANSITION CHARTS Europe: Class 1 and Class 2 of EN 60825-1: 1994 +A11:1996 +A2:2001 = IEC 60825-1:1993 +A1:1997 +A2:2001 U.S.A.: Class I and Class II of FDA (21 CFR1040.10)

Place the laser warning label and the FDA label on the sensor.

Radiological Health). (Accession Number: 1020665)

the following precautions for the safe use of the product:

(1) ZX2-LDDDD emits visual laser beam. Do not stare directly into the laser.

Make sure that the laser beam path is terminated. If specular objects are present in the laser beam path, make sure that they are prevented from reflecting the laser beam.

When used without an enclosure, make sure the laser path from eye level is avoided.

- (2) To avoid exposure to hazardous laser radiation, do not displace nor remove the protective housing during operation, maintenance, and any other servicing.
- (3) As for countries other than those of Europe and the U.S.A., observe the regulations and standards specified by each country.

(4) Label Indications

Laser Notice No. 50 (see note).

The EN and FDA labels are supplied with the product.

Replace the current labels with them according to the instructions given in the manuals.

Precautions for Safe Use

Please observe the following precautions for safe use of the products.

Installation Environment

- Do not use the product in environments where it can be exposed to inflammable/ explosive gas.
- Do not install the product close to high-voltage devices and power devices in order to secure the safety of operation and maintenance.

Power Supply and Wiring

- The supply voltage must be within the rated range (DC12 to 24 V±10%).
- Reverse connection of power supply is not allowed. Connection to AC power supply is also not allowed.
- · Open-collector outputs should not be short-circuited.
- High-voltage lines and power lines must be wired separately from this product.
 Wiring them together or placing in the same duct may cause induction, resulting in malfunction or damage.
- Always turn off the power supply before connecting or disconnecting cables and connectors.

Applicable standards

- EN61326-1
- Electromagnetic environment : Industrial electromagnetic environment

(EN/IEC 61326-1 Table 2)

 There may be cases that current output or voltage output fluctuate within 1%F.S when a sensor is experienced electromagnetic interference under the condition of the response time 30µs.

Others

- Do not attempt to dismantle, repair, or modify the product.
- · Dispose of this product as industrial waste.

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SETTING TRANSITION CHARTS Please observe the following precautions to prevent failure to operate, malfunctions, or undesirable effects on product performance.

Installation of the Product

Installation Site

Do not install the product in locations subjected to the following conditions:

- Ambient temperature outside the rating
- Rapid temperature fluctuations (causing condensation)
- Relative humidity outside the range of 35 to 85%
- Presence of corrosive or flammable gases
- · Presence of dust, salt, or iron particles
- Direct vibration or shock
- Reflective sensor of intense light (such as other laser beams or electric arc-welding machines)
- · Direct sunlight or near heaters
- · Water, oil, or chemical fumes or spray
- · Strong magnetic or electric field

Component Installation and Handling

Power Supply and Wiring

- When using a commercially available switching regulator, make sure that the FG terminal is grounded.
- If surge currents are present in the power lines, connect surge absorbers that suit the operating environment.
- When connecting two or more amplifier units by using calculating units, make sure that the linear GND lines of the amplifier units are connected to each other. Supply power to all connected amplifier units at the same time.
- Before turning ON the power after the product is connected, make sure that the power supply voltage is correct, there are no incorrect connections (e.g. load shortcircuit) and the load current is appropriate. Incorrect wiring may result in breakdown of the product.
- The ferrite core accessory must be attached to the sensor head cable before use. (For how to attach the ferrite core, see pages 24 and 28.)
- The cables must be 10 m or shorter in total length for amplifier units. For extension
 of the cable of amplifier units, shielded cables of the same type must be used. To
 extend the cable from the sensor head, an optional extension cable (ZX2-XC□R)
 must be used. Only one extension cable can be used.
 - When using calculating units, make sure that the linear GND lines of the amplifier units are connected to each other.

Warming Up

After turning ON the power supply, allow the product to stand for at least 10 minutes before use. The circuits are still unstable just after the power supply is turned ON, so measured values may fluctuate gradually.

A warmup of at least 10 minutes is also required after canceling LD-OFF input if LD-OFF input is being used.

Sensing Object

The product cannot accurately measure the following types of objects: Transparent objects, objects with an extremely low reflective sensor ratio, objects smaller than the beam size, objects with a large curvature, excessively inclined objects, etc.

Mutual Interference

Inserting a calculating unit between amplifier units can prevent mutual interference between two sensor heads.

Maintenance

- Always turn OFF the power supply before adjusting or connecting/disconnecting the sensor head.
- Do not use thinner, benzene, acetone or kerosene to clean the sensor head and amplifier units. If large dust particles adhere to the front filter of the sensor head, use a blower brush (used to clean camera lenses) to blow them off. Do not blow the dust away with your mouth. To remove smaller dust particles, use a soft cloth (for lenses) with a small amount of alcohol. Take care not to wipe them off with excessive force.

Scratches on the filter may cause errors.

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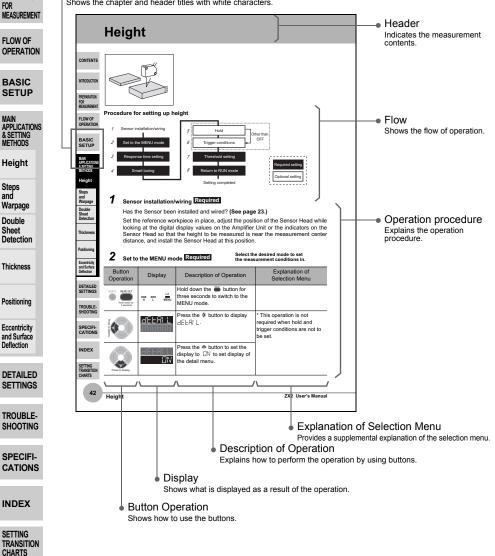
PREPARATION

Page Format

This section explains the page format by using the Setting for MAIN APPLICATIONS AND SETTING METHODS chapter as an example. INTRODUCTION

Index label

Shows the chapter and header titles with white characters.



Meanings of Symbols

Symbol	Meaning	CONTENTS
Important	Indicates points that are important to achieve the full product performance, such as operational precautions and applica- tion procedures.	INTRODUCTION
(For details about xxx, see page xx.)	Indicates pages where related information can be found.	PREPARATION FOR MEASUREMENT
Required (white characters on a black background)	Indicates a required setting in a setup procedure.	FLOW OF OPERATION
Optional (black characters on a white background)	Indicates an optional setting in a setup procedure.	BASIC SETUP
Pres lo diguy	Indicates which button to press to display the menu shown in the Display column.	MAIN APPLICATIONS & SETTING METHODS Height
Press to select Menu name Select the	Indicates that the user can select the menu that accords with their usage conditions by pressing the relevant button.	Steps and Warpage Double Sheet
Change numeric value	Indicates that the user can specify a value that accords with	Detection Thickness
Press to set.	their usage conditions by pressing the relevant button.	Positioning

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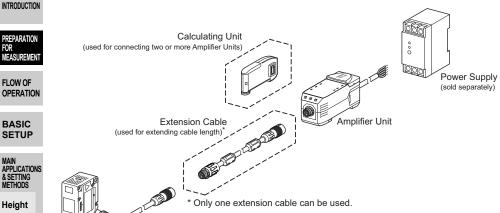
Part Names and Functions



For

Basic Configuration

The basic configuration of the ZX2 series Smart Sensors is shown below.



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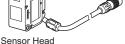
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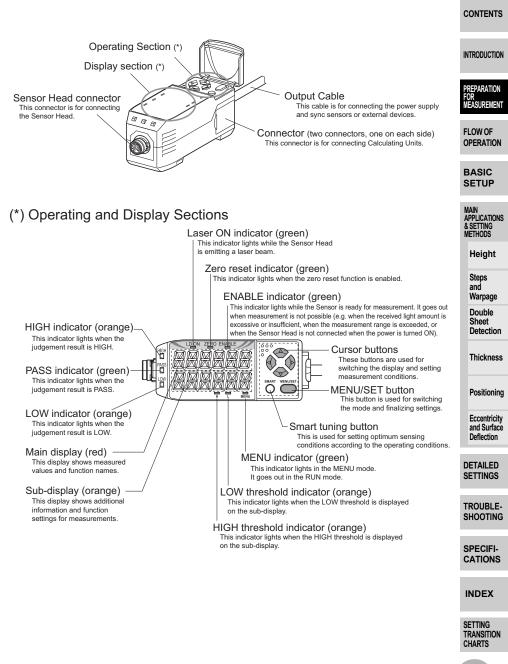
SETTING TRANSITION CHARTS



See the following pages for details:

	Part Names and Functions	Specifications and Dimensions
Sensor Heads	p. 22	p. 138
Amplifier Units	р. 19	p. 136
Calculating Unit	p. 22	p. 143
Extension Cables	—	p. 142

Amplifier Unit



Digital Displays

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The information displayed on the main and sub-displays depends on the currently CONTENTS selected mode. The default mode is the RUN mode.

When the power is turned ON, the model of Amplifier Unit (ZX2-LDA) will be displayed on the main display and the channel number will be displayed on the sub-display. Subsequently, the Sensor Head software version will be displayed on the main display and the Amplifier Unit software version will be displayed on the sub-display.

These details are displayed for approximately five seconds, and then data for the RUN mode will be displayed.

Mode	Main display (upper section, red)	Sub-display (lower section, orange)		
RUN	The measured value (the value after the measurement conditions have been reflected) is displayed. For example, when the hold function is set, the held value will be displayed. Default measured values are as follows:	By pressing the \$ button, the HIGH threshold, LOW threshold, analog output value, resolution (max. value of measured value during one second - min. value), current value (value before execution of zero reset, hold, scaling and 2-sensor operation), and BANK are displayed in this order.		
MENU	The function names are displayed in order by pressing the \$ \$ buttons.	The setting for the function displayed on the main display is displayed.		

(For details on setting transition charts, see page 158.)

Alphabet Display Format

The alphabet appears on the main and sub-displays as shown in the following table. SPECIFI-

CATIONS	А	В	С	D	Е	F	G	Н	I	J	К	L	Μ
INDEX	8	Ь	Γ	Ъ	Ε	F	Г	Н		Ц	К	L	М
	Ν	0	Р	Q	R	S	Т	U	V	W	Х	Y	Ζ
SETTING TRANSITION CHARTS	N		Р	Q	R	5	F	U	1/	K	Х	Ч	2

Button Operation

The functions of buttons change according to the currently selected mode.

CONTENTS

Button type		Button function				
		RUN mode	MENU mode	INTRODUCTION		
to button		 Normal press: Changes the sub-display content.* Both to buttons held down for three seconds: Locks button operation. 	Function changes depending on the setting. • Switches the function display. • Selects the digit of numerical values. • Stops setting.	PREPARATION FOR MEASUREMENT		
Cursor buttons	Sutton	Normal press: Executes timing input.	The function changes depending on the setting.	OPERATION		
Curs		 Held down for one second: Executes zero reset. Both buttons held down for one second: Cancels a zero reset. 	 Changes the selection menu. Changes numerical values. 	BASIC SETUP		
MENU/SET button		Held down for 3 seconds: Changes the mode to the MENU mode.	 Normal press: Finalizes the set condition or value. Held down for 3 seconds: Changes to the RUN mode. 	APPLICATIONS & SETTING METHODS Height Steps		
Smart tuning button		Held down for one second, held down for three seconds, held down for five seconds: Executes smart tuning according to the time the button is held down.	Held down for one second, held down for three seconds, held down for five seconds: Executes smart tuning according to the time the button is held down.	and Warpage Double Sheet Detection		

* For how to select the initial sub-display to be displayed when the power is turned on, see page 84.

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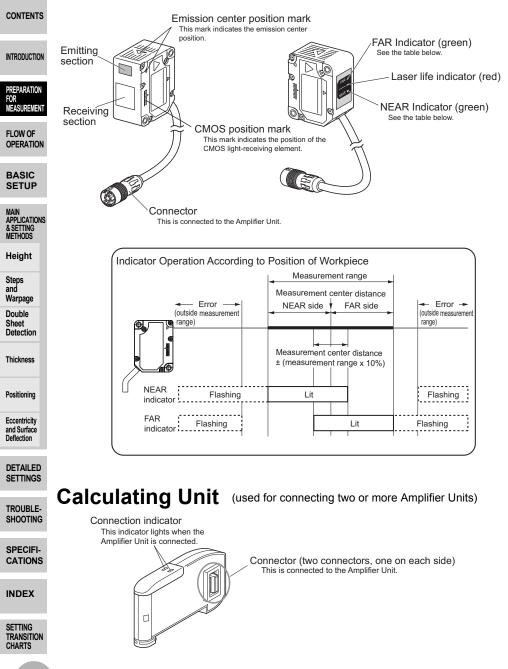
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Sensor Head



Installation

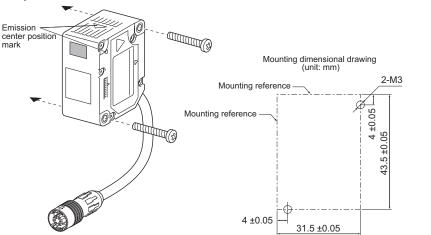
Important

Before connecting/disconnecting Smart Sensor components, make sure that the power to the Amplifier Unit is turned OFF. The Smart Sensor may malfunction if components are connected or removed while the power is ON.

Installing Sensor Heads

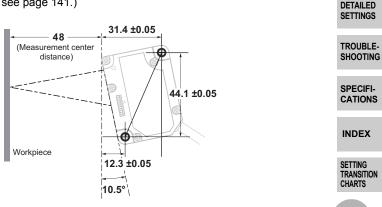
Installation Method

- · Check the Sensor Head setting position by its emission center mark.
- Fix the sensor head in place with M3 screws. The screws must be tightened with a torque of 0.5 N•m.



Tilt the regular-reflective model as shown below with respect to the workpiece.
 A mounting bracket can also be attached to the regular-reflective model to tilt it correctly. (E39-L178; see page 141.)

ZX2-LD50V



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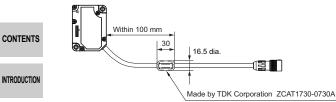
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• Be sure to attach the ferrite core accessory to the Sensor Head. Attach it within 100 mm of the Sensor Head side.

 When mounting a Sensor Head, take care not to touch the emitter and receiver. Finger marks on the emitter and receiver may hinder correct measurements. If you have touched



them by mistake, wipe them with a clean, soft cloth.

· Fix the connectors in places that are not subject to vibration or impact.

Important

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Installing the Amplifier Unit

Amplifier Units can be easily mounted to 35-mm DIN Track.

Hook on the connector end

decrease if the output cable end is hooked on the DIN Track first.

Installation Method

Hook the connector end of the Sensor Head on the DIN Track, and press in at the bottom until the Amplifier Unit locks into place. If necessary, fix it in place by the End Plate.

DIN Track (Option)

PFP-100N (shallow type/1 m) PFP-50N (shallow type/0.5 m)

PFP-100N2 (shallow type/1 m)

End Plate (Option)

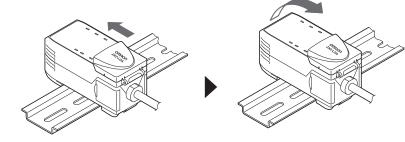
PFP-M

Removal Method

Important

Push the Amplifier Unit and pull out from the connector end of the Sensor Head.

Hook the connector end of the Sensor Head on the DIN Track first. The mounting strength may



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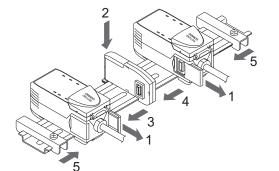
CONTENTS

Use a Calculating Unit to connect Amplifier Units when performing calculations between Amplifier Units and to prevent mutual interference between Sensor Heads.

INTRODUCTION The number of Amplifier Units that can be connected differs depending on the functions to be used.

PREPARATION For	Function	Number of Connectable Amplifier Units	See:
MEASUREMENT	Calculation	Up to two units (Up to five units can be connected. However, calculations are done between pairs of two.)	(A-B) calculation:
FLOW OF OPERATION		For (A-B) calculations A: CH2 or later	Page 47 Thickness
BASIC SETUP		B: CH1 CH2 CH2 CH2 CH2-CH1	calculation: Page 57
MAIN APPLICATIONS & SETTING METHODS		CH4 (CH3-CH1) CH5 (CH4-CH1) (CH5-CH1)	
Height	Mutual interference prevention	Up to five units	Page 88
Steps and Warpage	<u>.</u>	1	<u> </u>
Double Sheet Detection	For details on the cor	nnection method, see the next page.	
Thickness			
Positioning			
Eccentricity and Surface Deflection			
DETAILED SETTINGS			
TROUBLE- SHOOTING			
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INDEX			
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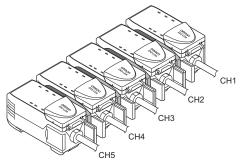
Connection Method



- **1** Open the connector cover on the Amplifier Unit. Open the connector cover by lifting and sliding it.
- **2** Mount the Calculating Unit to the DIN Track.
- **3** Slide and connect the Calculating Unit to the Amplifier Unit connector.
- **4** Slide and connect the second Amplifier Unit to the Calculating Unit connector.
- 5 Fix in place with the End Plate (sold separately: PFP-M).

Important

- To disconnect Amplifier Units and Calculating Units, perform the above operations in reverse order.
- The following diagram shows the channel numbers when multiple Amplifier Units are connected.



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SETTING TRANSITION CHARTS

Connecting the Sensor Head to the Amplifier Unit

Align the position of the connector \Rightarrow mark with the \blacktriangle mark on the Amplifier Unit, and

CONTENTS

Installation Method

· Extending the Sensor Head cable

Only one extension cable can be used.

An optional extension cable (ZX2-XC□R) must be used.

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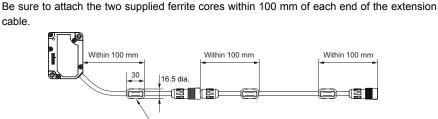
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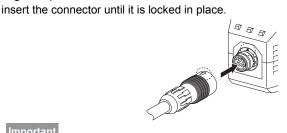
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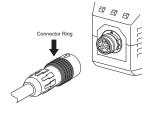


Made by TDK Corporation ZCAT1730-0730A



Removal Method

To disconnect the Sensor Head, hold the Sensor Head's connector ring and the Amplifier Unit connector, and then pull them straight out.



Important

- Do not touch the terminals inside the connector.
- · Prevent the connector from being subjected to static electricity.
- When the Sensor Head is replaced with a different type, set all the setting data inside the Amplifier Unit again since it will be cleared. (default values: → See page 123.)



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Wiring Diagram

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Wiring Input/Output Cables

Wire the cable correctly. Incorrect wiring may damage the Smart Sensor.

The input/output cable has the following wires.

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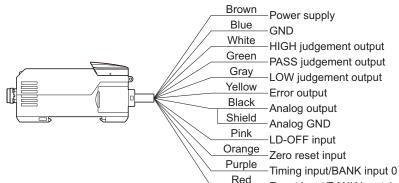
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(For details on the cable's conductor cross-section and insulation resistance, see page 136.)

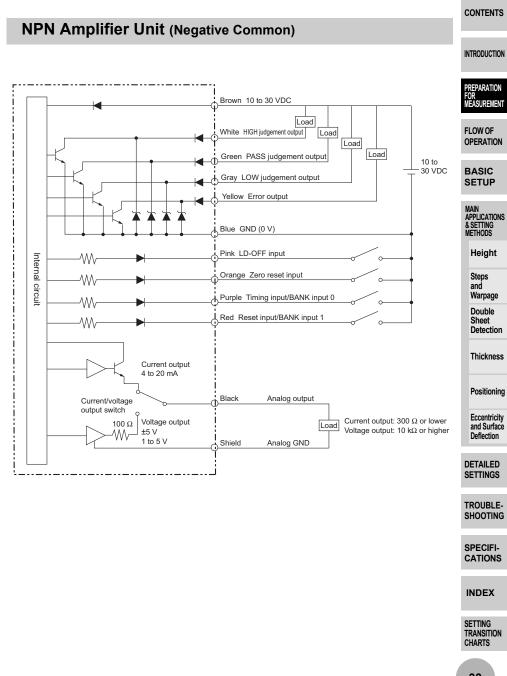
6	Cable color	Name	Function
g ty ce	Brown	Power supply	Connects the 10 to 30 VDC (including (p-p) 10% ripple) power supply. When using an Amplifier Unit with a PNP output, the power supply terminal is also the common I/O terminal for all I/O except for the analog output.
ED GS	Blue	GND (0 V)	The GND terminal is the 0 V power supply terminal. When using an Amplifier Unit with an NPN output, the power supply terminal is also the common I/O terminal for all I/O except for the analog output.
.E- NG	White	HIGH judgement output	The HIGH judgement output outputs judgement results (HIGH).
FI- NS	Green	PASS judgment output	The PASS judgement output outputs judgement results (PASS).
(Gray	LOW judgment output	The LOW judgement output outputs judgement results (LOW).
ION	Yellow	Error output	This is output when the system detects an error. (For details on error messages, see page 130.)

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Cable color	Name	Function	
Black	Analog output	The analog output outputs a current or voltage in accordance with the measured value. (For details on setting method, see page 109.)	CONTENTS
Shield	Analog GND (0 V)	The analog GND terminal is the 0 V terminal for the analog output.	INTRODUCTION
		 Important Use the shield for analog output separately from the blue (0V) wire for power supply. 	PREPARATION FOR MEASUREMENT
		• When analog output is not used, be sure to connect this wire to the blue (0 V) wire.	FLOW OF OPERATION
		 When using Calculating Units, make sure that the analog GND lines of the Amplifier Units are connected to each other. 	BASIC SETUP
Pink	LD-OFF input	If this LD-OFF input signal is ON, the laser will stop emission, causing a light intensity error. In this case, the analog output, digital display, judgement output, and judgement output display signals will be output according to the non-measurement settings. The sub-display will show Ld□FF. Warm up the sensor for at least 10 minutes after canceling LD-OFF input. (For details on the output during non-measurement,	MAIN APPLICATIONS & SETTING METHODS
			Height
			and Warpage
			Double Sheet Detection
Orange	Zero reset input	see page 111.) The zero reset input is used to execute and cancel zero reset.	Thickness
Orange		(For details, see page 101.)	Positioning
Purple	Timing input/ BANK input 0 (switched by external input setting)	but 0 Signal input wire for obtaining hold function timing. While by this input is being input, the sub-display will show	Eccentricity and Surface Deflection
			DETAILED SETTINGS
		When connecting two or more Amplifier Units, use the CH1 Amplifier Unit for bank switching. The banks of the Amplifier Units of CH2 and later are switched together	TROUBLE- SHOOTING
		with CH1. (For details on switching and inputs, see page 118.)	SPECIFI- CATIONS

	Cable	Name	Function
	color		
	Red	Reset input/BANK	Reset input:
		input 1 (switched	While a reset signal is being input, RESEL is displayed
CONTENTS		by external input	on the sub-display.
		setting)	 When the hold function is not used
INTRODUCTION			The output while a reset signal is being input is held in
INTRODUCTION			accordance with the output during non-measurement
			setting.
PREPARATION For			This feature can be used in cases such as to input a
MEASUREMENT			mask signal if you want to stop output for a certain
			period.
FLOW OF OPERATION			When the hold function is used If a react signal is input the state in affect before the
OF LIVETION			If a reset signal is input, the state in effect before the
PASIC			hold function was set will be restored. (For details on the hold function, see page 93, and
BASIC SETUP			for details on the output during non-measurement,
			see page 111.)
MAIN APPLICATIONS			
& SETTING			BANK input 1: Signal input wire for bank switching. Banks are switched
METHODS			by ON/OFF combinations with BANK input 0.
Height			When connecting two or more Amplifier Units, use the
Stone			CH1 Amplifier Unit for bank switching. The banks of the
Steps and			Amplifier Units of CH2 and later are switched together
Warpage			with CH1.
Double Sheet			(For details on switching and inputs, see page 118.)
Detection	Eor tho tir	ing at which they	a signals are input, see the timing charts on pages 144
	to 146.	ning at which thes	se signals are input, see the timing charts on pages 144
Thickness	10 140.		
Positioning			
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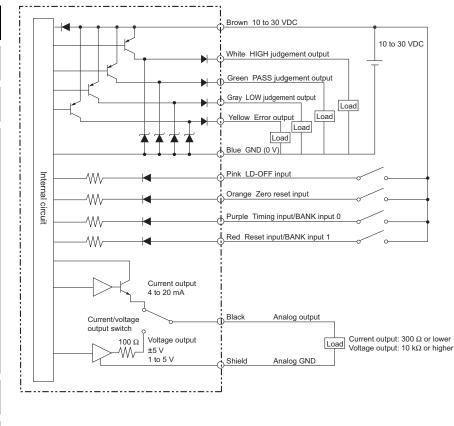
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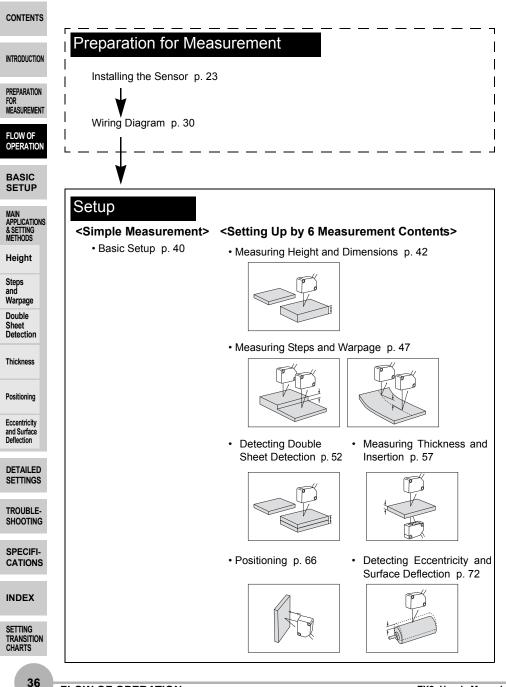
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(Output Setting During Input of the Re	set Signal at an Error)	P	METHODS
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Setting the Differential Function		p. 116	Height
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en an Error Occurs		I	Positioning
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0	p. 128	1	Eccentricity and Surface
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Detailed Settings

Selecting the Initial Sub-Display

Connecting Two or More Amplifier Units

• Smart Tuning (Optimizing the Sensing Conditions)

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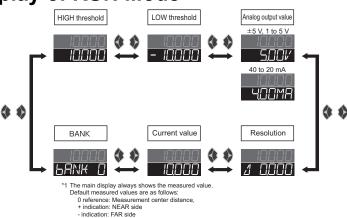
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For how to select the initial sub-display to be displayed when the power is turned on, see page 84.

The numerals shown in the above diagram are an example only. The actual display may be different.

Simplest Setting

Smart Tuning (Single Smart Tuning)

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

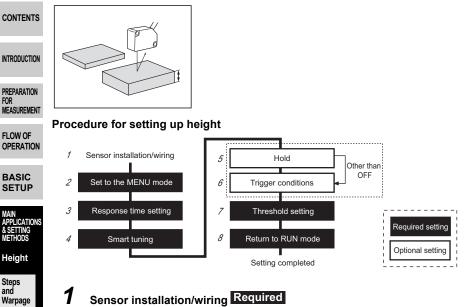
lickings	Button Operation	Display	Description of Operation	Explanation of Selection Menu
extensioning extension of the second		_	Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the distance between the Sensor Head and the workpiece is the measurement center distance, and install the Sensor Head at this position.	
HOOTING PECIFI- ATIONS NDEX	Hold down for 1 second	Pressing down	Press the button for one second. When SMARL/ SI NGLE is displayed, release your finger from the button to start execution of smart tuning.	If "FREE" flashes on the sub-display for three seconds, it indicates that tuning was not possible. Change the response time setting to a larger value, and itry again.
RANSITION		riastility		

To tune multiple workpieces or to tune workpieces having a different surface condition: page 80

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Height	42
Steps and Warpage	47
Double Sheet Detection	52
Thickness	57
Positioning	66
Eccentricity and Surface Deflection	72

Height



Has the Sensor been installed and wired? (See page 23.)

Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the height to be measured is near the measurement center distance, and install the Sensor Head at this position.

Set to the MENU mode Required ∕

Select the desired mode to set the measurement conditions in.

and Surface				
Deflection	Button Operation	Display	Description of Operation	Explanation of Selection Menu
DETAILED SETTINGS	SMART MENU/SET		Hold down the button for three seconds to switch to the	
TROUBLE- SHOOTING	Hold down for 3 seconds		MENU mode.	
300011110	Press	dEERI L	Press the 🏶 button to display	* This operation is not required when hold and
SPECIFI- CATIONS	res to display.			trigger conditions are not to be set.
INDEX		Idelai L Din	Press the ♥ button to set the display to □N to set display of the detail menu.	
SETTING TRANSITION CHARTS	Press to display.			

Double

Sheet Detection

Thickness

Positioning

Eccentricity and Sur

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
SMART MENU/SET		Press the button to apply the setting.		CONTENTS

3 Response time setting Required

Select the response time to match the size and moving speed of the sensing object.

Button Operation	Display	Description of Operation	Explanation of Selection Menu	PREPARATION For
Press to display;	58553 888888	Press the \$ button to display SPEEd.	Default value: 500 ms	MEASUREMENT FLOW OF OPERATION
Press to select	SPEEd IM5 Select the desired value.	Press the 💲 button to select the response time.	Select the response time to match the size and moving speed of the sensing object. $\begin{array}{c} \hline 60 \ \mu\text{s}, 120 \ \mu\text{s}, 240 \ \mu\text{s}, 500 \ \mu\text{s}, \\ 1 \ m\text{s}, 2 \ m\text{s}, 4 \ m\text{s}, 8 \ m\text{s}, 12 \ m\text{s}, \\ 20 \ m\text{s}, 36 \ m\text{s}, 66 \ m\text{s}, 128 \ m\text{s}, \\ 250 \ m\text{s}, 500 \ m\text{s} \end{array}$	BASIC SETUP MAIN APPLICATIONS & SETTING METHODS Height Steps
SMART MENU/SET		Press the button to apply the setting.	* After the response time is changed, the smart tuning results are cleared, so be sure to re-execute tuning.	and Warpage Double Sheet Detection

4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Eccentricity and Surface Deflection
_	_	Check that the reference workpiece is set in place.		DETAILED SETTINGS
SMART MENU/SET Hold down for 1 second	down for second. When SMARL/	Press the button for one second. When SMARL/ SI NGLE is displayed, release	If " FRILED " flashes on the Isub-display for three seconds, it indicates that	TROUBLE- SHOOTING
	your finger from the button to	tuning was not possible. Change the response time Isetting to a larger value, and	SPECIFI- CATIONS	
	SI NULE		try again.	
	Flashing			INDEX

* To tune multiple workpieces or to tune workpieces having a different surface condition: page 80

SETTING TRANSITION CHARTS

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INTRODUCTION

5 Hold Optional

Set this item to hold measured values during the measurement period according to preset hold conditions.

	•			
CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display.	<u> </u>	Press the ♦ button to display H□Ld.	Default value: OFF
PREPARATION FOR MEASUREMENT FLOW OF OPERATION	Press to select	PERK Select the	Press the 💲 button to select the hold conditions.	Hold OFF RIFE The average measured value
BASIC SETUP		desired value.		during the sampling period is held. PEP The difference between the minimum and maximum
MAIN APPLICATIONS & SETTING METHODS				values during the sampling period is held.
Height Steps and Warpage				The measured value at the start of the sampling period is held.
Double Sheet Detection				The minimum value during the sampling period is held.
Thickness				the sampling period is held. (For details, see page 95.)
Positioning Eccentricity and Surface	SMART MENU/SET		Press the button to apply the setting.	* The clamp value is output until the first sampling period is finished.
Deflection DETAILED SETTINGS			When other thanFF is selected, proceed to "6 Trigger conditions," and whenFF is selected, proceed to "7 Threshold	(For details on the clamp value, see page 111.)
TROUBLE- SHOOTING			setting."	of the hold measurement
SPECIFI- CATIONS		er conditions [Optional period is to be	input.
INDEX	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SETTING TRANSITION CHARTS	Press to display.	<u> </u>	Press the ♦ button to display ERI [].	Default value: TIMING
				·

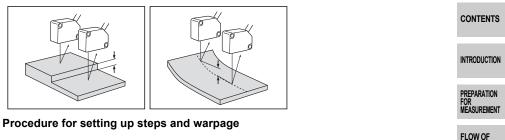
Button Operation	Display	Description of Operation	Explanation of Selection Menu	
	<u>ERIG</u> EIMING	Press the 💲 button to select the trigger conditions.	Enter the trigger by using the timing input or by pressing	CONTENTS
Press to select	Select the desired value.		the Sutton in the RUN mode. The period that the timing signal is ON is the sampling period.	INTRODUCTION
			SELF-d The sampling period is the	PREPARATION FOR MEASUREMENT
			period that the measured value is lower than the specified self-trigger level.	FLOW OF OPERATION
			SELF-U The sampling period is the period that the measured	BASIC SETUP
			value is greater than the specified self-trigger level. (For details, see page 97.)	MAIN APPLICATIONS & SETTING METHODS
SMART MENU/SET		Press the button to apply the trigger conditions.		Height
		When SELF-U and		Steps and Warpage
		SELF-d are selected, proceed to the next item, and		Double Sheet Detection
		when <code>LI MI N_</code> is selected, proceed to "7 Threshold setting."		Thickness
Pressto	SELF <u>L</u> V	Press the ♦ button to display SELFLI∕	Default value: 0.000	Positioning
display.				Eccentricity and Surface Deflection
		Press the sutton to enable setting of the self-trigger level.		DETAILED SETTINGS
[Change numeric value]	<u>SELFL/</u>	Press the 🔹 button to move the digit, press the 💲 button to	* If the \$ button is pressed when the cursor is at the	TROUBLE- SHOOTING
Press to set.	Set any value.	change the numeric value, and set the self-trigger level.	right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled.	SPECIFI- CATIONS
SMART MENU/SET		Press the button to apply the setting.		INDEX
	<u> </u>		1	SETTING TRANSITION CHARTS

7 Threshold setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

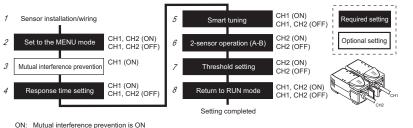
CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display	Lit H L MENU	Press the 🌒 button to display the HIGH threshold.	Setting example: Non-defective product height 0 to 10 mm
Preparation For Measurement			Press the 🏶 button to enable setting of the HIGH threshold.	H NG OK NG P L 0
FLOW OF OPERATION				Set the MAX and MIN heights to be regarded as OK
BASIC SETUP	[Change numeric value]	Set any value.	Press the (() button to move the digit, press the () button to change the numeric value, and set the HIGH threshold.	to the HIGH and LOW thresholds, respectively. * If the to button is pressed
MAIN APPLICATIONS & SETTING METHODS	SMART MENU/SET		Press the button to apply the setting.	when the cursor is at the right-most digit or the \$ button is pressed when the
Height Steps and Warpage	Press to display,	Lit H L MENU	Press the 🌒 button to display the LOW threshold.	cursor is at the left-most digit, the setting will be canceled.
Double Sheet Detection			Press the Sutton to enable setting of the LOW threshold.	threshold is greater than the LOW threshold.
Positioning	[Change numeric value]	CODO Set any value.	Press the () button to move the digit, press the () button to change the numeric value, and set the LOW threshold.	
and Surface Deflection	SMART MENU/SET		Press the button to apply the setting.	
SETTINGS	8 Retur	n to RUN mod	e Required Switch to the second secon	ne mode in which measurement
SHOOTING	Button Operation	Display	Description of Operation	Explanation of Selection Menu
	SMART MENU/SET Hold down for 3 seconds	Out H L MENU	Hold down the button for three seconds to switch to the RUN mode.	
SETTING TRANSITION CHARTS			settings, such as output and inp erence height to 0 (or the offset	

Steps and Warpage



The Amplifier Units to set up differ depending on whether mutual interference prevention is set to ON or OFF.

Note that different channels are used to specify each menu item, as shown below.



OFF: Mutual interference prevention is ON

Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Connect two Amplifier Units with a Calculating Unit in between. (The calculation result is displayed and output on the CH2 Amplifier Unit.)

Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that each of the heights to be measured is near the measurement center distance, and install the Sensor Head at this position.

2 Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

(Use CH1 and CH2 for these settings.)

Button Operation	Display	Description of Operation	Explanation of Selection Menu	INDEX
SMART MENU/SET Hold down for 3 seconds	H L MENU	Hold down the button for three seconds to switch to the MENU mode.		SETTING TRANSITION CHARTS

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	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	Press to display.	dELRI L 888888	Press the I button to display dELRI L.	
INTRODUCTION		delai L DN	Press the ♣ button to set the display to □N to set display of the detail menu.	
PREPARATION FOR MEASUREMENT	Press to display.			
FLOW OF OPERATION	SMART MENU/SET		Press the button to apply the setting.	
BASIC SETUP		al interference	prevention Optional interference	m to prevent the influence of mutual ce between two Sensor Heads.
MAIN APPLICATIONS & SETTING METHODS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Height	Press to	<u> </u>	Press the 🏶 button on the CH1 Amplifier Unit to display 54NE.	Default value: OFF
Steps and Warpage				
Double Sheet Detection		<u> </u>	Press the ♥ button to display □N.	
Thickness	Press to display.		Press the 👅 button to apply	* For datails on the reasons
Positioning	SMART MENU/SET		the setting.	* For details on the response time when connecting two or more Amplifier Units, see page 86.
and Surface Deflection				<u> </u>
DETAILED SETTINGS	<u> </u>	onse time setti	ing Required and moving	esponse time to match the size speed of the sensing object.
TROUBLE-			prevention is set to OFF: Use CH	v
SHOOTING	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SPECIFI- CATIONS	Press to displ	SPEEd	Press the 🌢 button to display	Default value: 500 ms
INDEX	display.	000000		
SETTING TRANSITION CHARTS				

Button Operation	Display	Description of Operation	Explanation of Selection Menu			
	IMS	Press the 💲 button to select the response time.	Select the response time to match the size and moving speed of the sensing object.	CONTENTS		
Press to select	Select the desired value.		60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms,	INTRODUCTION		
SMART MENU/SET		Press the button to apply the setting.	250 ms, 500 ms * After the response time is changed, the smart tuning	PREPARATION FOR MEASUREMENT		
		the setting.	results are cleared, so be sure to re-execute tuning.	FLOW OF OPERATION		
5 Smart	t tuning Requ	ired according to the	s optimum sensing conditions operating conditions nd color/state of workpiece)	BASIC SETUP		
		prevention is ON: Use CH prevention is set to OFF: Use CH	11 for these settings. 11 and CH2 for these settings.	MAIN APPLICATIONS & SETTING METHODS		
Button Operation	Display	Description of Operation	Explanation of Selection Menu	Height		
_	_	Check that the reference workpiece is set in place.		Steps and Warpage		
SMART MENU/SET Hold down for 1 second	Pressing down SMRRL SINGLE Pressed down LUNING SINGLE	Pressing down	сморі		If "FRILED" flashes on the sub-display for three seconds, it indicates that	Double Sheet Detection
		SI NGLE is displayed, release your finger from the button to start execution of smart tuning.	tuning was not possible. Change the response time Isetting to a larger value, and try again. * If mutual interference	Thickness		
				Positioning		
	Flashing		prevention is set to ON, after smart tuning execution for	Eccentricity and Surface Deflection		
			CH1 ends, it is also executed for the Amplifier Units of CH2 and later. If the tuning result	DETAILED SETTINGS		
			is NG for either Amplifier Unit, the smart tuning setup results are not applied to any	TROUBLE- SHOOTING		
			amplifier units.	SPECIFI-		

* To tune multiple workpieces or to tune workpieces having a different surface CATIONS condition: page 80

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6 2-sensor operation (A-B) Required

Set this item when calculating the difference between the measurement results from two Sensor Heads. The measurement result for CH1 is substracted from the measurement result of the channel being set.

CONTENTS (Use CH2 for these settings.)

INTRODUCTION	Button Operation	Display	Description of Operation	Explanation of Selection Menu
PREPARATION FOR MEASUREMENT	Press to display.	<u></u> 888888	Press the to button on the CH2 Amplifier Unit to display [RL[.	Calculating Unit CH1
FLOW OF OPERATION				
BASIC SETUP				CH2 (Calculation result is output.)
MAIN APPLICATIONS & SETTING METHODS	Press to select	<u>ERLE</u> R-b	Press the ┋ button to display 用−占.	
Height	SMART MENU/SET		Press the button to apply	* For details on the response
Steps and Warpage			the setting.	time when connecting two or more Amplifier Units, see page 86.
Double Sheet Detection				page oo.

Thickness

7 Threshold setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

(Use CH2 for these settings.)

Positioning	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Eccentricity	Operation			Selection Menu
and Surface Deflection	Pre		Press the \$ button on the CH2	Setting example:
DETAILED SETTINGS	ss to display.	Lit H L MENU	Amplifier Unit to display the HIGH threshold.	Non-defective product step 3 to 8 mm
				□ ^{NG} _OK NG
TROUBLE- SHOOTING				
SPECIFI- CATIONS				P
				Set the MAX and MIN steps
INDEX				to be regarded as OK to the HIGH and LOW thresholds,
OFTTINO				respectively.
SETTING TRANSITION				<u> </u>

SETTING TRANSITI CHARTS

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Button Operation	Display	Description of Operation	Explanation of Selection Menu	
		Press the Soutton to enable setting of the HIGH threshold.	* If the \$ button is pressed when the cursor is at the right-most digit or the \$ button is pressed when the	CONTENTS
[Change numeric value]	12.345 8000	Press the ** button to move the digit, press the \$ button to change the numeric value, and	cursor is at the left-most digit, the setting will be canceled.	INTRODUCTION
Press to set.	Set any value.	set the HIGH threshold.	* Set so that the HIGH threshold is greater than the	PREPARATION FOR MEASUREMENT
SMART MENU/SET		Press the button to apply the setting.	LOW threshold.	FLOW OF
Press to display.	H L MENU	Press the 🌒 button to display the LOW threshold.		BASIC SETUP
		Press the 🏶 button to enable setting of the LOW threshold.		MAIN APPLICATIONS & SETTING METHODS Height
[Change numeric value]	12.345 3000E	Press the (**) button to move the digit, press the (*) button to change the numeric value, and		Steps and Warpage
Press to set.	Set any value.	set the LOW threshold. Press the 👅 button to apply	-	Double Sheet Detection
SMART MENU/SET		the setting.		Thickness

8 Return to RUN mode Required

Switch to the mode in which measurement is performed.

(Use CH1 and CH2 for these settings.)

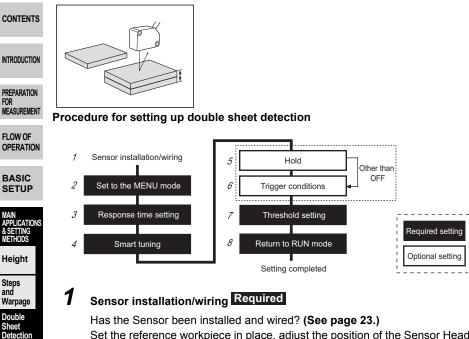
Button	Diamlay	Description of Operation	Explanation of	Defiection
Operation	Display	Description of Operation	Selection Menu	DETAILED
SMART MENU/SET	Out	Hold down the 🖱 button for		SETTINGS
Hold down for 3 seconds		three seconds to switch to the RUN mode.		TROUBLE- SHOOTING

* For details on optimizing settings, such as output and input, see "DETAILED SETTINGS."

Positioning

Eccentricity and Surface

Double Sheet Detection



Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the measured value at measurement of one product and at measurement of two products is within the measurement range, and install the Sensor Head at this position.

Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

and Surface					
Deflection	Button Operation	Display	Description of Operation	Explanation of Selection Menu	
DETAILED SETTINGS	SMART MENU/SET	Lit	Hold down the button for three seconds to switch to the		
TROUBLE- SHOOTING	Hold down for 3 seconds	H L MENU	MENU mode.		
			Press the 🕴 button to display	* This operation is not	
SPECIFI- CATIONS	Press to display.	<u>dELAI L</u> 888888	dELAI L.	required when hold and trigger conditions are not to be set.	
INDEX		dELRI L	Press the 拳 button to set the display to □N to set display of		
SETTING TRANSITION CHARTS	Press to display.	BN	the detail menu.		

Thickness

Positioning

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Button Operation	Display	Description of Operation	Explanation of Selection Menu	
SMART MENU/SET		Press the button to apply the setting.		CONTENTS

3 Response time setting Required

Select the response time to match the size and moving speed of the sensing object.

INTRODUCTION	

Positioning

	Button Operation	Display	Description of Operation	Explanation of Selection Menu	PREPARATION FOR MEASUREMENT
	Press to display,	<u> </u>	Press the \$ button to display SPEEd.	Default value: 500 ms	FLOW OF OPERATION
-			Press the 💲 button to select the	Select the response time to	BASIC SETUP
	Press to select		response time.	match the size and moving speed of the sensing object.	MAIN APPLICATIONS & SETTING
	F 1055 IO SEIECI	Select the desired value.		60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms,	MaiHods Height
-	CALADY MENUICES			250 ms, 500 ms	Steps and Warpage
	SMART MENU/SET		Press the 👅 button to apply the setting.	* After the response time is changed, the smart tuning results are cleared, so be sure to re-execute tuning.	Double Sheet Detection
-					Thickness

4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Eccentricity and Surface Deflection
_		Check that the reference workpiece is set in place.		DETAILED SETTINGS
SMART MENU/SET Hold down for 1 second		second When SMUUL	If " FRILED" flashes on the sub-display for three seconds, it indicates that	TROUBLE- SHOOTING
	Pressed down	Pressed down your finger from the button to	tuning was not possible. Change the response time setting to a larger value, and	SPECIFI- CATIONS
	SI NGLE Flashing		try again.	INDEX

* To tune multiple workpieces or to tune workpieces having a different surface SETTING TRANSITION CHARTS

5 Hold Optional

Set this item to hold measured values during the measurement period according to preset hold conditions.

	•			
CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display.	H0Ld 888888	Press the ♦ button to display H□L⊣.	Default value: OFF
PREPARATION For Measurement		HOLJ PE8k	Press the 💲 button to select the hold conditions.	DFF Hold OFF R⊮E
FLOW OF OPERATION	Press to select	Select the desired value.		The average measured value during the sampling period is held.
BASIC SETUP				PEDP The difference between the minimum and maximum
MAIN APPLICATIONS & SETTING METHODS				values during the sampling period is held.
Height				The measured value at the start of the sampling period is
Steps and Warpage				held. held. held. The minimum value during
Double Sheet Detection				the sampling period is held.
Thickness				the sampling period is held. (For details, see page 95.)
Positioning	SMART MENU/SET		Press the button to apply the setting.	* The clamp value is output until the first sampling period
Eccentricity and Surface Deflection			When other than <a>DFF is selected, proceed to "6	is finished. (For details on the clamp value, see page 111.)
DETAILED SETTINGS			Trigger conditions," and when <i>DFF</i> is selected, proceed to "7 Threshold setting."	
TROUBLE- SHOOTING			Set how timi	ng of the hold measurement
SPECIFI- CATIONS		er conditions [Optional period is to b	pe input.
INDEX	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SETTING TRANSITION CHARTS	Press to display.	<u> </u>	Press the ು button to display 上RI ☐.	Default value: TIMING
		1		

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
	ERIG EI MI NG	Press the 💲 button to select the trigger conditions.	Enter the trigger by using the timing input or by pressing the the button in the RUN	CONTENTS
Press to select	Select the desired value.		mode. The period that the timing signal is ON is the	INTRODUCTION
			sampling period. SELF-d The sampling period is the	PREPARATION FOR MEASUREMENT
			period that the measured value is lower than the specified self-trigger level.	FLOW OF OPERATION
			SELF-U The sampling period is the period that the measured	BASIC SETUP
			value is greater than the specified self-trigger level. (For details, see page 97.)	MAIN APPLICATIONS & SETTING METHODS
SMART MENU/SET		Press the button to apply the trigger conditions.		Height
		When SELF-U and		Steps and Warpage
		SELF - d are selected, proceed to the next item, and when ∠I MI N_ is selected,		Double Sheet Detection
		proceed to "7 Threshold setting."		Thickness
Press to d	<u>SELFLI/</u>	Press the ♦ button to display SELFLV	Default value: 0.000	Positioning
isplay.				Eccentricity and Surface Deflection
		Press the sutton to enable setting of the self-trigger level.		DETAILED SETTINGS
[Change numeric value]	<u>561.617</u> 99999	Press the \$\$ button to move the digit, press the \$ button to	* If the \$ button is pressed when the cursor is at the	TROUBLE- SHOOTING
Press to set.	Set any value.	change the numeric value, and set the self-trigger level.	right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled.	SPECIFI- CATIONS
SMART MENU/SET		Press the button to apply the setting.		INDEX
		the county.		SETTING TRANSITION CHARTS

7 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display	Lit H L MENU	Press the 🌒 button to display the HIGH threshold.	Examples:
FOR MEASUREMENT FLOW OF OPERATION			Press the Sutton to enable setting of the HIGH threshold.	Set the HIGH and LOW thresholds right in the middle of the measured values of sheets 1 and 2 and sheets 1
BASIC SETUP	[Change numeric value]	A Set any value.	Press the (**) button to move the digit, press the (**) button to change the numeric value, and set the HIGH threshold.	and 0, respectively. * If the \$ button is pressed when the cursor is at the right-most digit or the \$
MAIN APPLICATIONS & SETTING METHODS	SMART MENU/SET		Press the button to apply the setting.	button is pressed when the cursor is at the left-most digit,
Height Steps and Warpage	Press to display.	H L MENU	Press the \$ button to display the LOW threshold.	the setting will be canceled. * Set so that the HIGH threshold is greater than the LOW threshold.
Double Sheet Detection Thickness			Press the 🏶 button to enable setting of the LOW threshold.	LOW theshold.
Positioning	[Change numeric value]	– 0,500 Set any value.	Press the ** button to move the digit, press the \$ button to change the numeric value, and set the LOW threshold.	
and Surface Deflection	SMART MENU/SET		Press the button to apply the setting.	
SETTINGS	8 Retur	n to RUN mod	e Required Switch to the is performed.	mode in which measurement
SHOOTING	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CATIONS	SMART MENU/SET	Out	Hold down the button for	

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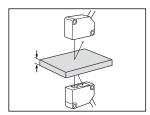
For details on optimizing settings, such as output and input, see "Detailed Settings." Example (Setting the reference height to 0 (or the offset value): **Zero Reset** \rightarrow **page 101**)

three seconds to switch to the

RUN mode.

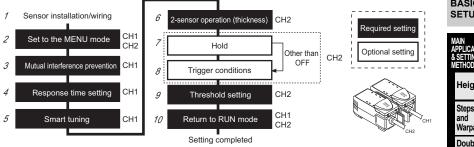
Hold down for 3 seconds T T

Thickness



Procedure for setting up thickness

The Amplifier Units to set up differ for each menu. Note also that different channels are used to specify each menu item, as shown below.



Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Connect two Amplifier Units with a Calculating Unit in between. (The calculation result is displayed and output on the CH2 Amplifier Unit.)

Set up the two Sensor Heads so that they are facing each other, adjust the positions of the Sensor Heads while looking at the digital display values on the Amplifier Units or the indicators on the Sensor Heads so that the clearance between the sensing object and each Sensor Head is near the measurement center distance, and install the Sensor Heads at these positions.

Prepare a reference sensing object of known thickness.

2 Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

(Use CH1 and CH2 for these settings.)

Button Operation	Display	Description of Operation	Explanation of Selection Menu	INDEX
SMART MENU/SET	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.		SETTING TRANSITION CHARTS

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DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	Press to display.	dELRI L 888888	Press the I button to display dELRI L.	
INTRODUCTION		dEERI L	Press the 拳 button to set the display to □N to set display of	
PREPARATION For Measurement	Press to display.	ON	the detail menu.	
FLOW OF OPERATION	SMART MENU/SET		Press the button to apply the setting.	
BASIC SETUP		al interference	prevention Required interferen	tem to prevent the influence of mutual ice between two Sensor Heads.
MAIN APPLICATIONS & SETTING METHODS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Height	Press to	<u> </u>	Press the 🏘 button on the CH1 Amplifier Unit to display 54NE.	Default value: OFF
Steps and Warpage	display,			
Double Sheet Detection		<u>Sync</u> On	Press the ✤ button to display □N.	
Thickness Positioning	SMART MENU/SET		Press the button to apply the mutual interference prevention setting.	* For details on the response time when connecting two or more Amplifier Units, see page 86.
Eccentricity and Surface Deflection	4 Resp	onse time setti	ng Required Select the re	sponse time to match the size speed of the sensing object.
DETAILED SETTINGS		CH1 for these s	-	
TROUBLE- SHOOTING	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SPECIFI- CATIONS	Press to display.	<u>SPEEd</u> 888888	Press the s button on the CH1 Amplifier Unit to display SPEEd.	Default value: 500 ms
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	Button Operation	Display	Description of Operation	Explanation of Selection Menu	
			Press the 💲 button to select the	Select the response time to	
		IMS	response time.	match the size and moving speed of the sensing object.	CONTENTS
	Press to select	Select the		60 μs, 120 μs, 240 μs, 500 μs,	
	desired value.	desired value.		1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms,	INTRODUCTION
			250 ms, 500 ms	PREPARATION	
	SMART MENU/SET		Press the 🖱 button to apply	* After the response time is	FOR MEASUREMENT
			the setting.	changed, the smart tuning results are cleared, so be	
				sure to re-execute tuning.	FLOW OF OPERATION

5 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

(Use CH1 for these settings.)

Button Operation	Display	Description of Operation	Explanation of Selection Menu	MAIN APPLICATIONS & SETTING METHODS
_	_	Check that the reference workpiece is set in place.		Height Steps
Hold down for	Pressing down	Press the button on the CH1 Amplifier Unit for one second. When SMRRE/SI NGLE is displayed, release your finger from the button to start execution of smart tuning.	If " File Control of the sub-display for three seconds, it indicates that tuning was not possible. Change the response time setting to a larger value, and try again. * After smart tuning execution for CH1 ends, it is also executed for the Amplifier Units of CH2 and later. If the tuning result is NG for either Amplifier Unit, the smart tuning setup results are not applied to any amplifier units.	Double Sheet Detection Thickness Positioning Eccentricity and Surface Deflection DETAILED SETTINGS TROUBLE- SHOOTING

* To tune multiple workpieces or to tune workpieces having a different surface condition: page 80

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SETTING TRANSITION CHARTS

Make this initial setting to measure thickness when using two Sensor Head to measure thickness.

6 2-sensor operation (thickness) Required

(Use CH2 for these settings.)

	,		o ,	
CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION			Set the reference sensing object of which thickness is known in place.	Calculating Unit
Preparation For Measurement	—	—		CHI
FLOW OF OPERATION				(Calculation result is output.)
BASIC SETUP	Press to display.	 888888	Press the the button on the CH2 Amplifier Unit to display [RL[.	
APPLICATIONS & SETTING METHODS Height	Press to select	EALC EXICX	Press the 💲 button to display 上HI [K.	
Steps and Warpage	SMART MENU/SET		Press the button to apply the thickness setting.	
Double Sheet Detection Thickness	[Change numeric value]	Set any value.	Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the thickness numeric value.	* If the \$ button is pressed when the cursor is at the right-most digit or the \$ button is pressed when the cursor is at the left-most digit,
Positioning			New St.	the setting will be canceled.
Eccentricity and Surface Deflection	SMART MENU/SET		Press the button to apply the setting.	* The 2-sensor operation reference value is determined based on the measured values of CH1 and CH2 by the timing
DETAILED SETTINGS				that setting of the thickness numeric values is executed. * For details on the response
TROUBLE- SHOOTING				time when connecting two or more Amplifier Units, see page 86.
SPECIFI- CATIONS		1	1	1
INDEX				
SETTING				

SETTING TRANSITION CHARTS Important

- If analog output is to be used, the entered thickness value is used as the center value of the analog output range. (For example, 0 V is used if the analog output is ±5 V.)
- After thickness calculation, the maximum and minimum measurement range values (CH2 measurement values) are assigned as the maximum and minimum analog output range.
- Concerning the minimum and maximum analog output values, the analog output minimum value is output for the smaller of the post-thickness calculation values, and the analog output maximum value is output for the larger of these values.

Example: If the ZX2-LD50 is used, a thickness value of 20 mm is entered, and analog output from –5 to 5 V is specified.

	Measured Value After Thickness Calculation	How the Measurement Value Is Calculated	Analog Output	FLOW
	10.000	Thickness value – (CH2 measurement range/2) = 20.000 – 10.000	–5 V	BAS SET
Ī	20.000	Thickness value = 20.000	0 V	MAIN
Ī	30.000	Thickness value+ (CH2 measurement range/2)= 20.000+10.000	5 V	APPL & SET METH

* The measurement range for the ZX2-LD50 is ±10 mm.

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7 Hold Optional

Set this item to hold measured values during the measurement period according to preset hold conditions.

(Use CH2 for these settings.)

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to disp	<u> </u>	Press the to button on the CH2 Amplifier Unit to display Hald.	Default value: OFF
PREPARATION For Measurement			Press the 💲 button to select the	OFF
FLOW OF OPERATION	Press to select	PERK Select the	hold conditions.	Hold OFF <u> <i>HIE</i></u> The average measured value
BASIC SETUP		desired value.		during the sampling period is held. P EO P
MAIN APPLICATIONS & SETTING METHODS				The difference between the minimum and maximum values during the sampling period is held.
Height				SRMPLE
Steps and Warpage				The measured value at the start of the sampling period is held.
Double Sheet Detection				boeling The minimum value during
Thickness				the sampling period is held.
Positioning				the sampling period is held. (For details, see page 95.)
Eccentricity and Surface Deflection	SMART MENU/SET		Press the button to apply the setting.	* The clamp value is output until the first sampling period is finished.
DETAILED SETTINGS			When other than []FF is selected, proceed to "8 Trigger conditions," and	(For details on the clamp value, see page 111.)
TROUBLE- SHOOTING			when []FF is selected, proceed to "9 Threshold setting."	
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8 Trigger conditions Optional

(Use CH2 for these settings.)

(Use CH2 for these settings.)					
Button Operation	Display	Description of Operation	Explanation of Selection Menu	CONTENTS	
Press to dis	<u> </u>	Press the ♦ button on the CH2 Amplifier Unit to display ∠RI [].	Default value: TIMING	INTRODUCTION	
day.		Press the 💲 button to select the	ELMI NG	PREPARATION FOR MEASUREMENT	
Press to select	EL MI NG	trigger conditions.	Enter the trigger by using the timing input or by pressing the Southern the RUN	FLOW OF OPERATION	
	desired value.		mode. The period that the timing signal is ON is the sampling period.	BASIC SETUP	
			SELF-d The sampling period is the period that the measured value is lower than the	MAIN APPLICATIONS & SETTING METHODS	
			specified self-trigger level.	Height Steps	
			The sampling period is the period that the measured value is greater than the	and Warpage Double	
			specified self-trigger level. (For details, see page 97.)	Sheet Detection	
SMART MENU/SET		Press the button to apply the trigger conditions.		Thickness Positioning	
		When SELF-U and SELF-U are selected, proceed to the next item, and		Eccentricity and Surface Deflection	
		when EI MI NE is selected, proceed to "9 Threshold setting."		DETAILED SETTINGS	
Press to disp	SELFLV	Press the \$ button to display	Default value: 0.000	TROUBLE- SHOOTING	
		Press the 🍣 button to enable		SPECIFI- CATIONS	
		setting of the self-trigger level.		INDEX	
	L		·	SETTING	

SETTING TRANSITION CHARTS

	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	[Change numeric value]	99.999	Press the (() button to move the digit, press the () button to change the numeric value, and set the self-trigger level.	* If the s button is pressed when the cursor is at the right-most digit or the s button is pressed when the
INTRODUCTION	Press to set.	Set any value.		cursor is at the left-most digit, the setting will be canceled.
PREPARATION FOR MEASUREMENT	SMART MENU/SET		Press the button to apply the setting.	

9 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

(Use CH2 for these settings.)

BASIC				
SETUP	Button Operation	Display	Description of Operation	Explanation of Selection Menu
MAIN APPLICATIONS & SETTING METHODS Height	Press to display.	Lit H L MENU	Press the the button on the CH2 Amplifier Unit to display the HIGH threshold.	Setting example: Non-defective product thickness 3 to 8 mm
Steps and Warpage Double Sheet			Press the 🏶 button to enable setting of the HIGH threshold.	
Detection Thickness	[Change numeric value]	BODD Set any value.	Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the HIGH threshold.	Set the MAX and MIN thicknesses to be regarded as OK to the HIGH and LOW
Positioning	SMART MENU/SET		Press the button to apply the setting.	 thresholds, respectively. * If the \$ button is pressed
Eccentricity and Surface Deflection DETAILED SETTINGS	Press to daplay	Lit H L MENU	Press the the button to display the LOW threshold.	when the cursor is at the right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled.
TROUBLE- Shooting			Press the Sutton to enable setting of the LOW threshold.	* Set so that the HIGH threshold is greater than the LOW threshold.
SPECIFI- CATIONS	[Change numeric value]	12,345 3,000	Press the \$ button to move the digit, press the \$ button to change the numeric value, and	
INDEX	Press to set.	Set any value.	set the LOW threshold.	
SETTING TRANSITION	SMART MENU/SET		Press the button to apply the setting.	

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FLOW OF

OPERATION

10 Return to RUN mode Required

Switch to the mode in which measurement is performed.

(Use CH1 and CH2 for these settings.)

Button Operation	Display	Description of Operation	Explanation of Selection Menu	CONTENTS
SMART MENU/SET	Out	Hold down the button for three seconds to switch to the RUN mode.		INTRODUCTION

* For details on optimizing settings, such as output and input, see "DETAILED FOR MEASUREMENT"

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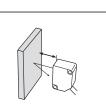
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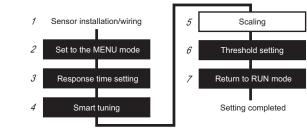
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Procedure for setting up positioning





Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Set the sensing object in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the upper and lower limits of the distance between the Sensor Head and the sensing object is within the measurement range, and install the Sensor Head at this position.

Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

ROUBLE- HOOTING	Button Operation	Display	Description of Operation	Explanation of Selection Menu
PECIFI- ATIONS	SMART MENU/SET Hold down for 3 seconds	Lit H L MENU	Hold down the three button for three seconds to switch to the MENU mode.	
IDEX ITTING IANSITION IARTS	Press to deplay.	delai l Baabaa	Press the ♦ button to display dELRI L.	* This operation is not required when scaling is not to be set.

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
Press to display.	<u>delri L</u> On	Press the ♣ button to set the display to ☐N to set display of the detail menu.		CONTENTS
SMART MENU/SET		Press the b button to apply the setting.		INTRODUCTION
3 Resp	onse time setti	Select the r	esponse time to match the size speed of the sensing object.	PREPARATION FOR MEASUREMENT
		······································		FLOW OF OPERATION
Button Operation	Display	Description of Operation	Explanation of Selection Menu	
Press to	SPEEd	Press the 🔹 button to display	Default value: 500 ms	BASIC SETUP
display.				MAIN APPLICATIONS & SETTING METHODS
	SPEEd	Press the 💲 button to select the response time.	Select the response time to match the size and moving	Height
Press to select	Select the		speed of the sensing object.	Steps and
	desired value.		60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms,	Warpage Double
			20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms	Sheet Detection
SMART MENU/SET		Press the button to apply the setting.	* After the response time is changed, the smart tuning	Thickness
		U	results are cleared, so be sure to re-execute tuning.	Positioning
	1		1	Eccentricity and Surface Deflection

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4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

		•	(
CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	_	_	Check that the reference workpiece is set in place.	
PREPARATION FOR MEASUREMENT FLOW OF OPERATION	Hold down for 1 second	Pressing down SMARE J NGLE Pressed down EUNI NG SI NGLE	Press the button for one second. When SMARL/ SI NOLE is displayed, release your finger from the button to start execution of smart tuning.	If "FALLEC" flashes on the isub-display for three seconds, it indicates that tuning was not possible. Change the response time isetting to a larger value, and try again.
BASIC SETUP MAIN APPLICATIONS & SETTING	* To tune condition:		ieces or to tune workpieces	having a different surface
& SETTING METHODS Height	5 Scalir	g Optional	Set this item to change the display a digital value on the Amplifier Un measured value. (e.g. to display t	nit different from the actual
Steps and Warpage Double	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Sheet Detection Thickness	Press to display,	<u>SCALE</u> 888888	Press the 🌢 button to display SERLE .	Default value: OFF
Positioning Eccentricity and Surface Deflection	Press to display.	<u>SERLE</u> On	Press the 拳 button to display □N.	
DETAILED SETTINGS	SMART MENU/SET		Press the button to enable setting of scaling.	
TROUBLE- SHOOTING				
SPECIFI- CATIONS				
INDEX				
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Button Operation	Display	Description of Operation	Explanation of Selection Menu	
Press to display,	<u>5 I-6EF</u> -99999	Press the ♦ button to display 5 I-BEF .	<to actual="" display="" distance="" sensing="" the=""></to>	CONTENTS
		Press the 🏶 button to enable setting of S1-Before.	-8 0 8 + 58 50 42	INTRODUCTION PREPARATION FOR
[Change numeric value] More digit	-8000 [Numeric	Press the () button to move the digit, press the () button to change the numeric value, and set the measured value before	58 After	FLOW OF OPERATION
Press to set.	value before change] Set any value.	S1 is changed.	Before -8 S1 S2	BASIC SETUP
SMART MENU/SET		Press the button to apply the numeric value of S1-Before.	* If the \$ button is pressed when the cursor is at the	MAIN APPLICATIONS & SETTING METHODS
Press to display	<u>5 I-RFE</u> -99999	Press the ♦ button to display 5 I-RFE .	right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled.	Height Steps and Warpage
		Press the 🏶 button to enable setting of S1-After.		Double Sheet Detection
[Change numeric value]	5 H-AFE 58,000 [Numeric value after change]	Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the measured value after S1 is changed.		Thickness Positioning Eccentricity and Surface
SMART MENU/SET	Set any value.	Press the to apply the numeric value of S1-After.		Deflection DETAILED SETTINGS
				TROUBLE- SHOOTING

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	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	Press to display.	<u>52-66F</u> -99999	Press the \$ button to display 52-667.	58 42
			Press the 🏶 button to enable setting of S2-Before.	8
PREPARATION FOR MEASUREMENT	[Change numeric value]		Press the 😻 button to move	 s1 s2 * If the sources is pressed
FLOW OF OPERATION	Press to set.	52-66- 8,000 [Numeric	the digit, press the 💲 button to change the numeric value, and set the measured value before	when the cursor is at the right-most digit or the button is pressed when the cursor is at the left-most digit,
BASIC SETUP		value before change] Set any value.	S2 is changed.	the setting will be canceled.
APPLICATIONS & SETTING METHODS	SMART MENU/SET		Press the button to apply the numeric value of S2-Before.	
Height Steps and Warpage	Press to display.	<u>52-AFE</u> -99999	Press the ♦ button to display 52-RFL .	
Double Sheet Detection			Press the Sutton to enable setting of S2-After.	
Thickness	[Change numeric value]		Press the 😻 button to move	
Positioning	[Move digit]	42,000	the digit, press the s button to change the numeric value, and	
Eccentricity and Surface Deflection	Press to set.	[Numeric value after change]	set the measured value after S2 is changed.	
DETAILED SETTINGS	SMART MENU/SET	Set any value.	Press the 🛎 button to apply	
TROUBLE- SHOOTING			the numeric value of S2-After.	
SPECIFI- CATIONS				
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SETTING TRANSITION CHARTS				

6 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

Button Operation	Display	Description of Operation	Explanation of Selection Menu	CONTENTS
Press to display.	Lit H L MENU	Press the 🏶 button to display the HIGH threshold.	Setting example: Non-defective product position 49 to 51 mm	INTRODUCTION
		Press the Soutton to enable setting of the HIGH threshold.		PREPARATION FOR MEASUREMENT
			51 49 Set the positioning MAX and	FLOW OF OPERATION
[Change numeric value]	Set any value.	Press the (() button to move the digit, press the () button to change the numeric value, and set the HIGH threshold.	MIN distances to the HIGH and LOW thresholds, respectively.	BASIC SETUP
SMART MENU/SET		Press the button to apply the setting.	* If the the button is pressed when the cursor is at the	MAIN APPLICATIONS & SETTING METHODS
Press	H L MENU	Press the to button to display the LOW threshold.	right-most digit or the \$ button is pressed when the	Height
is to display.			cursor is at the left-most digit, the setting will be canceled.	Steps and Warpage
		Press the 🍣 button to enable setting of the LOW threshold.	* Set so that the HIGH threshold is greater than the	Double Sheet Detection
		-	LOW threshold.	Thickness
[Change numeric value]	49,000 Set any value.	Press the (**) button to move the digit, press the (*) button to change the numeric value, and		Positioning
Press to set.		set the LOW threshold. Press the button to apply		Eccentricity and Surface Deflection
		the setting.		DETAILED SETTINGS

7 Return to RUN mode Required

Switch to the mode in which measurement is performed.

Button Operation	Display	Description of Operation	Explanation of Selection Menu	SPECIFI- CATIONS
SMART MENU/SET Hold down for 3 seconds	Out	Hold down the button for three seconds to switch to the RUN mode.		INDEX

For details on optimizing settings, such as output and input, see "DETAILED * SETTINGS."

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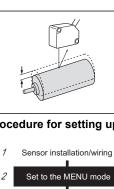
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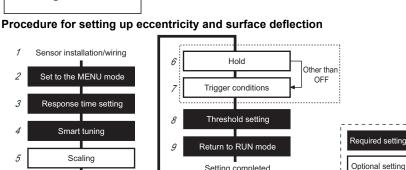
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SET TRA CHARTS





Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Set the sensing object in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the clearance between the Sensor Head and the sensing object is near the measurement center distance, and install the Sensor Head at this position.

Setting completed

2 Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

TAILED	Button Operation	Display	Description of Operation	Explanation of Selection Menu
TTINGS OUBLE- OOTING	SMART MENU/SET Hold down for 3 seconds	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.	
PECIFI-	Press to display.	<u>dEERI L</u> 888888	Press the 🌢 button to display dELRI L.	* This operation is not required when scaling, hold and trigger conditions are not to be set.
DEX TTING ANSITION ARTS	Press to display.	<u>delri L</u> On	Press the button to set the display to □N to set display of the detail menu.	

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
SMART MENU/SET		Press the button to apply the setting.		CONTENTS

3 Response time setting Required

Button

Select the response time to match the size and moving speed of the sensing object.

Explanation of

PREPARATIO
FOR

INTRODUCTION

Operation	Display	Description of Operation	Selection Menu	PREPARATION FOR MEASUREMENT
Press to display.	<u>588888</u>	Press the \$ button to display SPEEd.	Default value: 500 ms	FLOW OF OPERATION
Press to select	Select the desired value.	Press the 💲 button to select the response time.	Select the response time to match the size and moving speed of the sensing object. 60 μ s, 120 μ s, 240 μ s, 500 μ s, 10 μ s, 20 μ s, 200 μ s, 200 μ s, 200 μ s, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms	BASIC SETUP MAIN APPLICATIONS & SETTING METHODS Height Steps
SMART MENU/SET		Press the button to apply the setting.	* After the response time is changed, the smart tuning	and Warpage Double
			results are cleared, so be sure to re-execute tuning.	Sheet Detection

4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Eccentricity and Surface Deflection
_	—	Check that the reference workpiece is set in place.		DETAILED SETTINGS
SMART MENU/SET Hold down for 1 second	Pressing down	Press the b utton for one second. When SMARL/ SI NGLE is displayed, release	If "FILED" flashes on the sub-display for three seconds, it indicates that tuning was not possible.	TROUBLE- SHOOTING
	Pressed down	your finger from the button to start execution of smart tuning.	Change the response time setting to a larger value, and	SPECIFI- CATIONS
	Flashing		try again.	INDEX

* To tune multiple workpieces or to tune workpieces having a different surface condition: **page 80**

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5 Scaling Optional

Set this item to change the display scale when you want to display a digital value on the Amplifier Unit different from the actual measured value. (e.g. to reverse the - and + indications)

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display.	<u></u> 888888	Press the the button to display SERLE .	Default value: OFF
PREPARATION FOR MEASUREMENT FLOW OF OPERATION	Press to display.	<u>SCALE</u> ON	Press the ✤ button to display □N.	
BASIC	SMART MENU/SET		Press the 👅 button to enable setting of scaling.	
SETUP MAIN APPLICATIONS & SETTING METHODS	Press to display.	<u>5 I-68F</u> -99999	Press the 🌒 button to display 5 I-6EF -	To set the NEAR and FAR sides as - and + indications to the sensor:
Height Steps and			Press the 🏶 button to enable setting of S1-Before.	0
Warpage Double Sheet Detection Thickness	[Change numeric value] More of the set of th	[Numeric value before change] Set any value.	Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the measured value before S1 is changed.	2 2 1 2 Before
Positioning	SMART MENU/SET		Press the button to apply the numeric value of S1-Before.	-1After
Eccentricity and Surface Deflection DETAILED SETTINGS	Press to display	5 -RFE -99999	Press the ♦ button to display 5 I-RFE.	* If the \$ button is pressed
TROUBLE- SHOOTING			Press the Sutton to enable setting of S1-After.	when the cursor is at the right-most digit or the button is pressed when the cursor is at the left-most digit,
SPECIFI- CATIONS	[Change numeric value]	<u>13 I- RFL</u> 2000	Press the (**) button to move the digit, press the (**) button to change the numeric value, and	the setting will be canceled.
INDEX	Press to set.	[Numeric value after change] Set any value.	set the measured value after S1 is changed.	
SETTING TRANSITION CHARTS	SMART MENU/SET		Press the button to apply the numeric value of S1-After.	

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
Press to display.	<u>52-66F</u> -99999	Press the ♥ button to display 52-66F.	2 1 1 2 9 Before	CONTENTS
		Press the Sutton to enable setting of S2-Before.	After	INTRODUCTION
[Change numeric value]		Press the 👀 button to move	S1 S2	PREPARATION FOR MEASUREMENT
Press to set.	[Numeric value before	the digit, press the subtton to change the numeric value, and set the measured value before S2 is changed.	* If the \$ button is pressed when the cursor is at the right-most digit or the \$	FLOW OF OPERATION
	change] Set any value.		button is pressed when the cursor is at the left-most digit, the setting will be canceled.	BASIC SETUP
SMART MENU/SET		Press the button to apply the numeric value of S2-Before.		MAIN APPLICATIONS & SETTING METHODS
Press to display	<u>52-RFE</u> -99999	Press the 🏶 button to display 52-RFE .		Height Steps and
		Press the 🏶 button to enable setting of S2-After.		Warpage Double Sheet Detection
[Change numeric value]	<u>52-8FE</u>	Press the 🗱 button to move the digit, press the 💲 button to		Thickness
Press to set.	[Numeric value after change]	change the numeric value, and set the measured value after S2 is changed.		Positioning Eccentricity and Surface Deflection
SMART MENU/SET	Set any value.	Press the 🗯 button to apply		DETAILED
		the numeric value of S2-After.		SETTINGS
6 Hold	Optional	Set this item to hold measured valu period according to preset hold co		TROUBLE- SHOOTING

Button Operation	Display	Description of Operation	Explanation of Selection Menu	SPECIFI- CATIONS
Press to di	HOLd	Press the ♦ button to display H□Ld.	Default value: OFF	INDEX
splay.				SETTING TRANSITION CHARTS

	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	Press In salect	PERK Select the	Press the 💲 button to select the hold conditions.	Hold OFF
INTRODUCTION		desired value.		during the sampling period is held. P EC P
PREPARATION For Measurement				The difference between the minimum and maximum
FLOW OF OPERATION				values during the sampling period is held.
BASIC SETUP				The measured value at the start of the sampling period is held.
MAIN APPLICATIONS & SETTING METHODS				The minimum value during the sampling period is held.
Height				The maximum value during the sampling period is held.
Steps and Warpage			MU197	(For details, see page 95.)
Double Sheet Detection	SMART MENU/SET		Press the button to apply the setting.	* The clamp value is output until the first sampling period is finished.
Thickness			When other than DFF is selected, proceed to "7	(For details on the clamp value, see page 111.)
Positioning			Trigger conditions," and when DFF is selected, proceed to "8 Threshold	
Eccentricity and Surface Deflection			setting."	

DETAILED

7

Trigger conditions Optional

Set how timing of the hold measurement period is to be input.

TROUBLE- SHOOTING	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SPECIFI- CATIONS	Press to display	<u> </u>	Press the ♦ button to display 上RI [].	Default value: TIMING
INDEX				

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
	ERIG EI MI NG	Press the 💲 button to select the trigger conditions.	Enter the trigger by using the timing input or by pressing the so button in the RUN	CONTENTS
Press to select	Select the desired value.	n	mode. The period that the timing signal is ON is the	INTRODUCTION
			sampling period. SELF-d The sampling period is the	PREPARATION For Measurement
			period that the measured value is lower than the specified self-trigger level.	FLOW OF OPERATION
			SELF-U The sampling period is the period that the measured	BASIC SETUP
			value is greater than the specified self-trigger level. (For details, see page 97.)	MAIN APPLICATIONS & SETTING METHODS
SMART MENU/SET		Press the button to apply		Height
		the trigger conditions. (When $5ELF-U$ and		Steps and Warpage
		SELF - d are selected, proceed to the next item, and when b M N is selected,		Double Sheet Detection
		proceed to "8 Threshold setting."		Thickness
Press to di	<u>SELF,LV</u>	Press the ♦ button to display SELFLV.	Default value: 0.000	Positioning
splay.				Eccentricity and Surface Deflection
		Press the Soutton to enable setting of the self-trigger level.		DETAILED SETTINGS
[Change numeric value]	SELFLV	Press the 😻 button to move the digit, press the 💲 button to	* If the \$ button is pressed when the cursor is at the	TROUBLE- SHOOTING
Press to set.	Set any value.	change the numeric value, and set the self-trigger level.	right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled.	SPECIFI- CATIONS
SMART MENU/SET		Press the button to apply the setting.		INDEX
		<u> </u>	<u> </u>	SETTING TRANSITION CHARTS

8 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display.	Lit H L MENU	Press the the button to display the HIGH threshold.	Setting example: Non-defective product eccentricity -1 to 1 mm
PREPARATION FOR MEASUREMENT FLOW OF OPERATION			Press the 🏶 button to enable setting of the HIGH threshold.	1 mm -1 mm
BASIC SETUP	[Change numeric value]	Set any value.	Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the HIGH threshold.	H P L Set the eccentricity MAX and MIN distances to be regarded as OK to the HIGH
MAIN APPLICATIONS & SETTING METHODS	SMART MENU/SET		Press the button to apply the setting.	and LOW thresholds, respectively.
Height Steps and Warpage	Press to display.	H L MENU	Press the \$ button to display the LOW threshold.	* If the \$ button is pressed when the cursor is at the right-most digit or the \$ button is pressed when the
Double Sheet Detection			Press the 拳 button to enable setting of the LOW threshold.	cursor is at the left-most digit, the setting will be canceled.
Thickness			Dress the AA button to move	* Set so that the HIGH
Positioning Eccentricity	[Change numeric value]	- (000 Set any value.	Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the LOW threshold.	threshold is greater than the LOW threshold.
and Surface Deflection	SMART MENU/SET		Press the button to apply the setting.	

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Return to RUN mode Required

Switch to the mode in which measurement is performed.

SPECIFI- CATIONS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CATIONS	SMART MENU/SET	Out	Hold down the 🖱 button for	
INDEX	Hold down for 3 seconds		three seconds to switch to the RUN mode.	

* For details on optimizing settings, such as output and input, see "DETAILED SETTINGS."

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Smart Tuning

Setting channels used when connecting multiple units If mutual interference prevention is ON: CH1 If mutual interference prevention is set to OFF: Each CH

Smart tuning:

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This setting option sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece).

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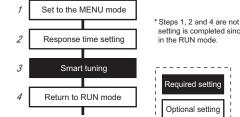
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Procedure for setting up smart tuning

* Steps 1, 2 and 4 are not required when the response time setting is completed since smart tuning can be performed even

Setting completed

Important

 When connecting two or more Amplifier Units and mutual interference prevention is set to ON, use the CH1 Amplifier Unit to execute tuning. After smart tuning execution for CH1 ends, it is also executed for the Amplifier Units of CH2 and later.

If the tuning result is NG for either Amplifier Unit, the smart tuning setup results are not applied to any amplifier units.

1 Set to the MENU mode Optional

Response time setting Optional

Display

22220

Button Operation	Displ	ay	Description of Operation	Explanation of Selection Menu
SMART MENU/SET Hold down for 3 seconds		Lit	Hold down the button for three seconds to switch to the MENU mode.	

Description of Operation

Press the \$ button to display

SPEEd.

7

Button

Operation

CATIONS

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Explanation of

Selection Menu

Default value: 500 ms

Button Operation	Display	Description of Operation	Explanation of Selection Menu		
Press to select	Select the desired value.	Press the 💲 button to select the response time.	Select the response time to match the size and moving speed of the sensing object. 60 µs, 120 µs, 240 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms	CONTENTS INTRODUCTION	
SMART MENU/SET		Press the 🖱 button to apply	* After the response time is	FOR MEASUREMENT	
		the setting.	the setting.	changed, the smart tuning results are cleared, so be sure to re-execute tuning.	FLOW OF OPERATION

3 Smart tuning Required

Select from one of the following three methods to execute smart tuning:

- (1) Tuning of a single stationary workpiece: Single smart tuning
- (2) Tuning of multiple stationary workpieces: Multi-smart tuning (a mix of workpieces having different color and state)
- (3) Tuning of workpieces having different surface states: Active smart tuning (execution of tuning while workpieces are moving)

(1) Tuning of a single stationary workpiece: Single smart tuning

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Thickness
_	_	Set the reference workpiece in place.		Positioning
Hold down for t second	Pressing down	Press the button for one second. When SMARE/ SINGLE is displayed, release your finger from the button to start execution of smart tuning.	If "FRIES" flashes on the sub-display for three seconds, it indicates that ituning was not possible. Change the response time setting to a larger value, and try again.	Eccentricity and Surface Deflection

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(a mix of workpieces having unrefer color and state)							
	Button Operation	Display	Description of Operation	Explanation of Selection Menu			
CONTENTS	_	_	Set reference workpiece 1 in place.				
INTRODUCTION	SMART MENU/SET Hold down for 3 seconds	Pressing down	Press the button for three seconds. When SMARE / MULEI is displayed, release	* SMARE /SI NELE is displayed for one to three seconds after the button is			
Preparation For Measurement		Pressed down	your finger from the button to start execution of smart tuning.	pressed, and then 5MRRE/ MULEF is displayed.			
FLOW OF OPERATION				If "FALLED" flashes on the sub-display for three seconds, it indicates that			
BASIC SETUP				tuning was not possible. Change the response time setting to a larger value, and			
MAIN APPLICATIONS & SETTING METHODS			Swap the workpiece with reference workpiece 2 and set it	try again.			
Height	—	_	in place.				
Steps and Warpage	SMART MENU/SET Hold down for 3 seconds	Pressing down	Press the button for three seconds. When SMRRL / MULLI is displayed, release	The optimum conditions are set for either reference workpiece 1 or 2 is set.			
Double Sheet Detection		Pressed down	↓ Pressed down	your finger from the button to start execution of smart tuning.	* SMRRE /SI NELE is displayed for one to three		
Thickness			When there are three or more reference workpieces, swap	seconds after the button is pressed, and then 도M뮤R上/ MULLLI is displayed.			
Positioning			each workpiece and repeat the procedure.	If you release your finger from the button SMRRE / SI NGLE, the result of tuning			
Eccentricity and Surface Deflection				workpiece 1 will not be reflected. If " FRI LED" flashes on the sub-display for three			
DETAILED SETTINGS				seconds, it indicates that tuning was not possible. Change the response time			
TROUBLE- Shooting				Isetting to a larger value, and try again.			
SPECIFI- CATIONS							
INDEX							
SETTING TRANSITION CHARTS							

(2) Tuning of multiple stationary workpieces: Multi-smart tuning (a mix of workpieces having different color and state)

(executio	(execution of tuning while workpieces are moving)				
Button Operation	Display	Description of Operation	Explanation of Selection Menu		
SMART MENU/SET	Pressing down	Press the button for five seconds with the workpiece set	* SMRRE/SI NGLE and SMRRE/MULEI are	CONTENTS	
Hold down for 5 seconds	SMARE ALEI VE	in place. When $SMRRE/$ REE/VE is displayed, release your finger from the button to	displayed for one to five seconds after the button is pressed, and then SMARE /	INTRODUCTION	
		start execution of smart tuning.	REIVE is displayed.	PREPARATION FOR MEASUREMENT	
	Flashing	smart tuning continues, move the workpiece.		FLOW OF OPERATION	
Hold down for 5 seconds		At the end of the desired tuning period, press the button again for 5 to end tuning.	The optimum setting conditions will be set.	BASIC SETUP	
			sub-display for three seconds, it indicates that tuning was not possible.	MAIN APPLICATIONS & SETTING METHODS	
			Change the response time setting to a larger value, and	Height	
4 Return to RUN mode Optional					
				Double	

(3) Tuning of workpieces having different surface states: Active smart tuning
(execution of tuning while workpieces are moving)

4	Return to RUN mode Optional
---	-----------------------------

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Sheet Detection
SMART MENU/SET	Out	Hold down the button for three seconds to switch to the		Thickness
Hold down for 3 seconds	H L MENU	RUN mode.		Positioning

TROUBLE-SHOOTING

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Selecting the Initial Sub-Display

Setting channels used when connecting multiple units: Each CH

CONTENTS

Initial sub-display:

Set to the MENU mode

Sub-display memory setting

Return to RUN mode Setting completed

Set to the MENU mode

Display

Lit

MENU

1

2

3

1

Button

Operation

SMART MENU/SET

Hold down fo 3 seconds

The initial sub-display is the display that appears when the power is turned on.

Description of Operation

Hold down the 🖱 button for

three seconds to switch to the

MENU mode.

INTRODUCTION Procedure for setting up initial sub-display

PREPARATION FOR MEASUREMENT

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MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage

Double Sheet Detection

2 Sub-display memory setting

П

T 1 (1)				
Thickness	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Positioning Eccentricity and Surface Deflection	Press to display;	SUBMEM	Press the I button to display	Default value: HIGH
DETAILED SETTINGS		R-CUL LOW	Press the 💲 button to select the sub-display memory.	HI CH HIGH threshold
TROUBLE- Shooting	Press to select	Select the desired value.		LOW threshold
SPECIFI- CATIONS				ے Resolution
INDEX				REAL Current value
SETTING TRANSITION				BANK

S CHARTS

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Explanation of

Selection Menu

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
SMART MENU/SET		Press the button to apply the setting.		CONTENTS

3 Return to RUN mode

Button Operation	Display	Description of Operation	Explanation of Selection Menu	PREPARATION
SMART MENU/SET	Out	Hold down the button for three seconds to switch to the		MEASUREMENT
Hold down for 3 seconds	H L MENU	RUN mode.		FLOW OF OPERATION



INTRODUCTION

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Connecting Two or More Amplifier Units

CONTENTS

Use a Calculating Unit to connect Amplifier Units when performing calculations between Amplifier Units and to prevent mutual interference between Sensor Heads.

The number of Amplifier Units that can be connected differs depending on the functions to be used.

	Function	Number of C	onnectable Amplifier Units	See:		
PREPARATION FOR	Calculation	Up to two units (Up to	o five units can be connected.	(A-B)		
MEASUREMENT		However, calculations	s are done between pairs of two.)	calculation:		
		For (A-B) c	alculations	Page 47		
FLOW OF OPERATION		A: CH2 or	ater	Thickness		
OF ERGHIOR		B: CH1		calculation:		
BASIC			CH1 CH2	Page 57		
SETUP						
			CH4 CH4-CH1)			
MAIN APPLICATIONS			(CH4-CH1) (CH5-CH1)			
& SETTING METHODS	Mutual interferen	aa Ula ta fiya yaita	(Ch3-Ch1)	Page 88		
	prevention	ce op to live units	Up to five units			
Height	prevention					
Steps	Important					
and	Supply power to all connected Amplifier Units at the same time.					
Warpage	When connecti	ng two or more Amplifier U	Inits, the response times (maximu	m values) are as		
Double Sheet	follows:	3		· · · · , · · · ·		
Detection	Mutual Interferen	ce Two-Sensor	Total Response Time			
	Prevention	Operation	•			
Thickness		OFF	Response time setting for ea			
	OFF	(A – B), THICK	(Total response time setting for e			
Positioning		OFF	(4 ms × number of connected	,		
	ON	(A – B), THICK	(Response time per unit (T) in the t number of connected un			
Eccentricity and Surface						
Deflection	<response if="" interference="" is="" mutual="" on="" prevention="" set="" time="" to=""></response>					
		CH1 Response Time Setting	Response Time per Unit (T)			
DETAILED		60 µs	3 ms			
SETTINGS		120 µs	3 ms			
		240 µs	3 ms	_		
TROUBLE- SHOOTING		500 µs 1 ms	4 ms	4		
onoormo		1 1115	8 ms	1		

SPECIFI-CATIONS

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SETTING TRANSITION CHARTS

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2 ms

4 ms

8 ms

12 ms

20 ms

36 ms

66 ms

128 ms

250 ms

500 ms

16 ms

32 ms

64 ms

72 ms

80 ms

100 ms

160 ms

280 ms

520 ms

1 s

The displayed and set up menus differ depending on the channel when two or more Amplifier Units are connected and when mutual interference prevention is set to ON.

Use the Amplifier Units of the corresponding channel numbers to specify settings by referring to the tables below.

INTRODUCTION

CONTENTS

<Menus and setting channels when two or more Amplifier Units are connected>

Menu	CHs Used to Specify Settings	CHs Not Used to Specify Settings	Notes	PREPARATION FOR MEASUREMENT
Mutual interference prevention 도님NC	-	CH2 to CH5: These cannot be used. (The setting menu is not displayed on the digital display.)	The setting of CH1 is also applied to Amplifier Units of CH2 and later.	FLOW OF OPERATION
Two-sensor operation setting	CH5	CH1: This cannot be used. (The setting menu is not displayed on the digital display.)		BASIC SETUP
Thickness setting				MAIN APPLICATIONS & SETTING METHODS
Bank switching setting 占用NK	CH1	CH2 to CH5: These cannot be used. (The setting menu is not displayed on the digital display.)	The Amplifier Units of CH2 and later are switched together with CH1. (Bank	Height
			registration is possible for individual amplifier units.) • Also use CH1 to switch the	Steps and Warpage
			banks by means of an external input.	Double Sheet Detection
Initialization I NI E		CH2 to CH5: These cannot be used. (The setting menu is not displayed on the digital display.)	The Amplifier Units of CH2 and later are initialized together with CH1.	Thickness

<Menus and setting channels when mutual interference prevention is set to ON>

Menu	CHs Used to Specify Settings	CHs Not Used to Specify Settings	Notes	Eccentricity and Surface Deflection
Response time setting SPEEd	-		The setting of CH1 is also applied to Amplifier Units of CH2 and later.	DETAILED SETTINGS
Smart tuning		executed for these separately.	Smart tuning for the Amplifier Units of CH2 and later are executed together with CH1.	TROUBLE- SHOOTING

(For details on the setup procedure when mutual interference prevention is set to ON, see the next page.)

INDEX

SPECIFI-

CATIONS

Positioning

Mutual Interference Prevention [Setting channel: CH1]

This refers to the function for preventing the influence of Sensor Heads when

mounted close to each other. (This function can be used for up to five Amplifier Units connected by using Calculating Units (ZX2-CAL).) INTRODUCTION Note: When the mutual interference prevention function is ON, external input cannot be used. PREPARATION Procedure for setting up mutual interference prevention FOR MEASUREMENT Amplifier Unit Set to the MENU mode Calculating Unit 1 FLOW OF Set on CH1 Amplifier Unit OPERATION Mutual interference 2 prevention setting BASIC 3 Return to RUN mode CH1 SETUP CH2 Setting completed сна MAIN APPLICATIONS сни & SETTING CH5 METHODS Heiaht Set to the MENU mode Steps and **Button** Explanation of Warpage Display Description of Operation Selection Menu Operation Double Sheet Hold down the 🖱 button of the SMART MENU/SET Detection Lit CH1 Amplifier Unit for three Π П MENU old down fo seconds to switch to the MENU Thickness mode. Press the \$ button to display * This step is not required if Positioning dFFBI defai L. detail menu display is already set to ON in the Eccentricity and Surface MENU mode Deflection Press the <> button to set the DETAILED display to IN to set display of SETTINGS the detail menu. TROUBLE-Press the button to apply SHOOTING SMART MENU/SET the setting. SPECIFI-CATIONS INDEX SETTING TRANSITION CHARTS

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Mutual interference prevention:

CONTENTS

2 Mutual interference prevention setting

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
Press	SYNC	Press the Solution to display	Default value: OFF	CONTENTS
to display.	888888			INTRODUCTION
	<u>Syne</u>	Press the ♥ button to display □N.		PREPARATION FOR MEASUREMENT
Press to display.		100.09		FLOW OF
SMART MENU/SET		Press the button to apply		
		the setting.		BASIC SETUP

3 Return to RUN mode

						APPLICATIONS
	Button	Displ	lav	Description of Operation	Explanation of	& SETTING METHODS
	Operation		- 5	···· • • • • • • • • • • • • • • • • •	Selection Menu	Height
	SMART MENU/SET			Hold down the 👅 button for		
			Out	three seconds to switch to the		Steps
	Hold down for 3 seconds	HL	MENU	RUN mode.		and
	3 seconds			RUN HIUUE.		Warpage
1						Double

Important

• When CH1 is used to specify a setting while mutual interference prevention is set to ON, the menus for which the same setting is applied to the Amplifier Units of CH2 and later are shown in the following table.

Specify settings for the menus in the following table after setting mutual interference prevention to ON.

Menu	Displayable and Specifiable CH Number	Notes		Eccentricity and Surface Deflection
Response time setting	CH1	The setting of CH1 is also applied to Amplifier Units of CH2 and later.	i	DETAILED
Smart tuning		Smart tuning for the Amplifier Units of CH2 and later are executed together with CH1.		SETTINGS

• When connecting two or more Amplifier Units, the response times (maximum values) are as follows:

Mutual Interference Prevention	Two-Sensor Operation	Total Response Time	SPECIFI-
	OFF	Response time setting for each CH	CATIONS
OFF	(A – B), THICK	(Total response time setting for each CH) + (4 ms × number of connected units)	INDEX
ON	OFF	(Response time per unit in the table below) ×	
011	(A – B), THICK	number of connected units	SETTING

MAIN

Sheet Detection

Thickness

Positioning

<Response time if mutual interference prevention is set to ON>

CH1 Response Time Setting	Response Time per Unit
60 µs	3 ms
120 µs	3 ms
240 µs	3 ms
500 µs	4 ms
1 ms	8 ms
2 ms	16 ms
4 ms	32 ms
8 ms	64 ms
12 ms	72 ms
20 ms	80 ms
36 ms	100 ms
66 ms	160 ms
128 ms	280 ms
250 ms	520 ms
500 ms	1 s

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Steps and Warpage

Double Sheet Detection

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Height Steps

METHODS

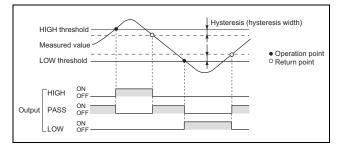
and Warpage

Double Sheet Detection

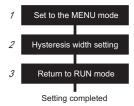
Thickness

Hysteresis width:

This refers to the difference between the operation point and return point. Set the hysteresis width for the upper and lower limits of the judgements if the HIGH, PASS or LOW judgement is unstable near the threshold values.



Procedure for setting up the hysteresis width



Set to the MENU mode

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Positioning
SMART MENU/SET Hold down for 3 seconds	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.		Eccentricity and Surface Deflection
T A		Press the 🕸 button to display	* This step is not required if	SETTINGS
Press to display.	<u>888888</u>	delai l.	detail menu display is already set to ON in the MENU mode.	TROUBLE- SHOOTING
	delai L	Press the ♣ button to set the display to □N to set display of the detail menu.		SPECIFI- CATIONS
Press to display.				INDEX
SMART MENU/SET		Press the 🖱 button to apply		
		the setting.		SETTING TRANSITION

CHARTS

2 Hysteresis width setting

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display.	888888 888888	Press the 🏼 button to display H님도 .	Default value: 0.000
PREPARATION FOR MEASUREMENT			Press the 🏶 button to enable setting of the hysteresis width.	
FLOW OF OPERATION	Press to display.		Press the 🔹 button to move	* If the \$ button is pressed
BASIC SETUP	Press to set.	Set any value.	the digit, press the \$\$ button to change the numeric value, and set the hysteresis width.	when the cursor is at the right-most digit or the \$ button is pressed when the
MAIN APPLICATIONS & SETTING METHODS				cursor is at the left-most digit, the setting will be canceled.
Height	SMART MENU/SET		Press the button to apply the setting.	
Steps and	3 Botur	n to PUN mod	•	

3 **Return to RUN mode**

Button Operation	Display	Description of Operation	Explanation of Selection Menu
SMART MENU/SET Hold down for 3 seconds	Out H L MENU	Hold down the button for three seconds to switch to the RUN mode.	

Important

- The hysteresis width for HIGH, PASS or LOW judgment is disabled when the hold function is enabled.
- The hysteresis width is enabled when the self-trigger is set.

DETAILED SETTINGS

Warpage Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

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Setting the Hold Function Setting channels used when connecting multiple units: Each CH

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FLOW OF

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MAIN APPLICATIONS & SETTING METHODS

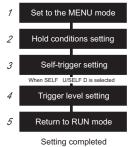
Height

OPERATION

Hold:

The hold function holds any values during the measurement period (sampling period), and outputs these values at the end of measurement.

Procedure for setting up hold



1 Set to the MENU mode

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Steps and Warpage
SMART MENU/SET Hold down for 3 seconds		Hold down the button for three seconds to switch to the MENU mode.		Double Sheet Detection
Press	dEERI L	Press the 🏘 button to display	* This step is not required if detail menu display is	Thickness
Press to display;	888888		already set to ON in the MENU mode.	Positioning
	delai L	Press the ♥ button to set the display to □N to set display of the detail menu.		Eccentricity and Surface Deflection
Press to display.			-	DETAILED SETTINGS
SMART MENU/SET		Press the 👅 button to apply		
		the setting.		TROUBLE- SHOOTING

SPECIFI-CATIONS

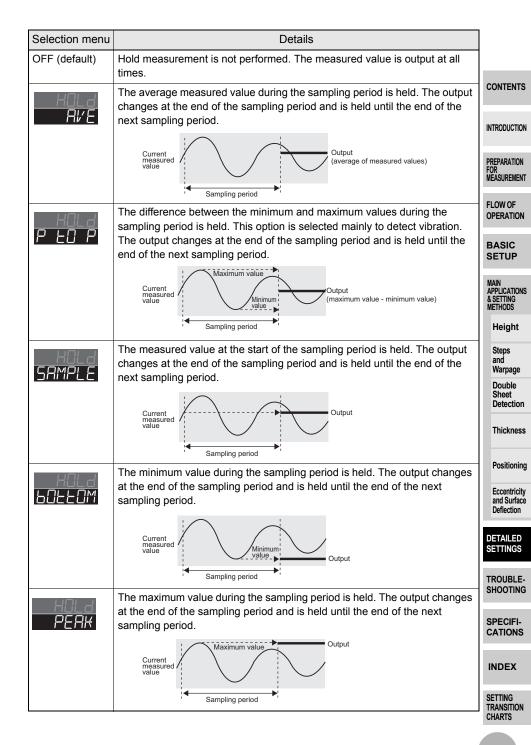
INDEX

2 Hold conditions setting

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS			Press the 🕸 button to display	Default value: OFF
INTRODUCTION	ress to display.	888888 8888888	HOLd.	
PREPARATION For Measurement		HOLJ PEAK	Press the 💲 button to select the hold conditions.	BFF Hold OFF R⊬E
FLOW OF OPERATION	Press to select	Select the desired value.		The average measured value during the sampling period is held.
BASIC SETUP				PEDP The difference between the minimum and maximum
MAIN APPLICATIONS & SETTING METHODS				values during the sampling period is held.
Height				The measured value at the start of the sampling period is
Steps and Warpage				held.
Double Sheet Detection				The minimum value during the sampling period is held.
Thickness				The maximum value during the sampling period is held. (For details, see the
Positioning				following page.)
Eccentricity and Surface Deflection	SMART MENU/SET		Press the to apply the setting.	* The clamp value is output until the first sampling period is finished.
DETAILED SETTINGS			When other than DFF is selected, proceed to "3 Self-trigger setting."	(For details on the clamp value, see page 111.)
TROUBLE- SHOOTING		1		<u>I</u>
SPECIFI- CATIONS				
INDEX				

SETTING TRANSITION CHARTS

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3 Self-trigger setting

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	Pre		Press the 🏶 button to display	Default value: TIMING
INTRODUCTION	s to display.	888888	ERI G.	
PREPARATION For Measurement		ERIG El MI NG	Press the 💲 button to select the self-trigger.	EI MI NC Enter the trigger by using the timing input or by pressing
FLOW OF OPERATION	Press to select	Select the desired value.		the Sutton in the RUN mode. The period that the timing signal is ON is the
BASIC SETUP				sampling period. SELF-d The sampling period is the
MAIN APPLICATIONS & SETTING METHODS				period that the measured value is lower than the specified self-trigger level.
Height				SELF-U
Steps and Warpage				The sampling period is the period that the measured value is greater than the
Double Sheet Detection				specified self-trigger level. (For details, see the following page.)
Thickness	SMART MENU/SET		Press the button to apply the self-trigger.	
Positioning			(When SELF-U and	
Eccentricity and Surface Deflection			SELF-d are selected, proceed to the next item, and when bl Ml NC is selected,	
DETAILED SETTINGS			proceed to "5 Return to RUN mode."	
TROUBLE- SHOOTING				
SPECIFI- CATIONS				
INDEX				

Selection menu	Details	
ERIG ELMING (Default)	Either input the timing signal from an external device, or enter the trigger for starting sampling by pressing the \bigcirc button. The period that the timing signal is ON is the sampling period.	CONTENTS
	Timing input OFF	INTRODUCTION
	(For details on external inputs, see page 118.)	
	The sampling period is the period that the measured value is lower than the specified self-trigger level. Hold measurement is possible without a	PREPARATION FOR MEASUREMENT
	sync input. Measured value	FLOW OF OPERATION
	Self-trigger level Self-trigger level Sampling period Sampling period Sampling period	BASIC SETUP
<u>ERI 6</u> 551 5-11	The sampling period is the period that the measured value is greater than the specified self-trigger level. Hold measurement is possible without a sync input.	MAIN APPLICATIONS & SETTING METHODS
	sync input.	Height
	Self-trigger level Hysteresis width	Steps and Warpage
	● Operation point Sampling period Sampling period ○ Return point	Double Sheet Detection
A Trisney lay		Thickness

4 Trigger level setting

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Positioning Eccentricity
Press to display.	<u>SELF.L/</u> 888888	Press the ♦ button to display SELFLV .	Default value: 0.000	DETAILED SETTINGS
		Press the Soutton to enable setting of the self-trigger level.		TROUBLE- SHOOTING
[Change numeric value]	<u>561.F.L.//</u>	Press the (**) button to move the digit, press the (**) button to change the numeric value, and	* If the \$ button is pressed when the cursor is at the right-most digit or the \$	SPECIFI- CATIONS
Press to set.	Set any value.	set the self-trigger level.	button is pressed when the cursor is at the left-most digit,	INDEX
			the setting will be canceled.	SETTING TRANSITION

Button Operation	Display	Description of Operation	Explanation of Selection Menu
SMART MENU/SET		Press the button to apply the setting.	

RUN mode.

INTRODUCTION

CONTENTS

5 Return to RUN mode

PREPARATION	Button Operation	Display	Description of Operation
MEASUREMENT	SMART MENU/SET		Hold down the button for three seconds to switch to the

fold down fo

FLOW OF OPERATION

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Heiaht

Steps and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

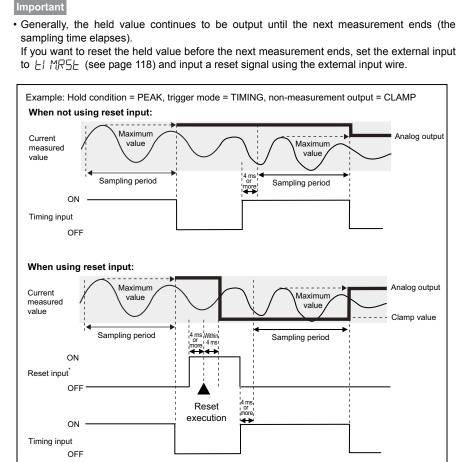
DETAILED SETTINGS

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SETTING TRANSITION CHARTS



* For the reset input timing, see the timing chart on page 144.

Explanation of

Selection Menu

Bank Setting

Setting channels used when connecting multiple units Bank switching: CH1 Bank registration: Each CH

The following menu settings can be registered to banks:

Bank setting:

1

2

CONTENTS Up to four sets of settings can be stored in memory. (Default: bank 0) This is recommended, for example, when measuring on multi-lot lines.

> HIGH threshold LOW threshold Response time

Hysteresis width

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SETTING TRANSITION CHARTS

4 Retu	arious settings Irm to RUN mode ting completed	Pre Po Pre Po Self Disp	asured value display scaling e-scaling display value 1 sst-scaling display value 1 e-scaling display value 2 sst-scaling display value 2 f-trigger level play during zero reset snig conditions en executing smart tuning				
 Important When connecting two or more Amplifier Units, use the CH1 Amplifier Unit for switching. The Amplifier Units of CH2 and later are switched together with CH1. Set to the MENU mode 							
Button Operation	Display	Description of Operat	tion Explanation of Selection Menu				
SMART MENU/SET Hold down for 3 seconds	Lit H L MENU	Hold down the to button three seconds to switch to MENU mode.					
Prest to display.	delai L	Press the 🏘 button to disp dELRI L.	play * This step is not required if detail menu display is already set to ON in the MENU mode.				
Press to display.	<u>delri L</u> On	Press the button to set display to □N to set displ the detail menu.					
		Press the 👅 button to ap					

the setting.

Procedure for setting up banks

Set to the MENU mode

Bank switching

2 Bank switching

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	Press	6 ANK	Press the 🕸 button to display	Default value: 0
INTRODUCTION	ss to display.	888888	. איוחם	
PREPARATION For Measurement		<u> </u>	Press the 💲 button to select the bank.	to 3
FLOW OF OPERATION	Press to select	Select the desired value.		
BASIC SETUP	SMART MENU/SET		Press the button to apply the setting.	



Height

Steps and

Warpage

Double Sheet Detection

Thickness

Positioning

3 Various settings

Set the various menu items that require setting.

Execute smart tuning for each bank to be used because the smart tuning results are not applied to other banks.

4 Return to RUN mode

Button Operation	Display	Description of Operation	Explanation of Selection Menu
SMART MENU/SET	Uut H L MENU	Hold down the button for three seconds to switch to the RUN mode.	

Either switch banks by following the steps $1 \rightarrow 2 \rightarrow 4$ described above, or input the

The following explains how to switch banks and perform measurement.

required signal from an external device to switch the bank.

Eccentricity and Surface Deflection

DETAILED SETTINGS

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Zero Reset

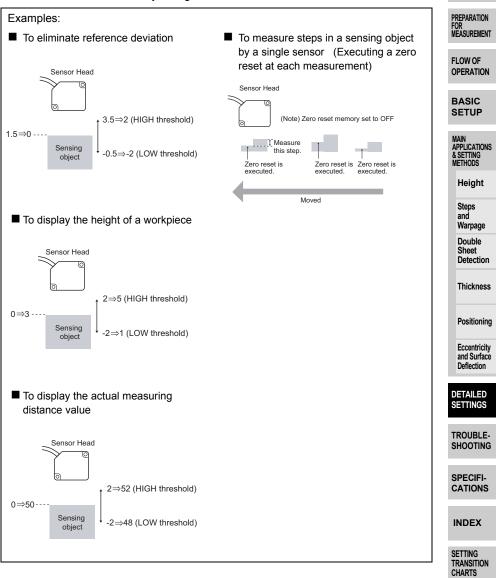
Setting channels used when connecting multiple units: Each CH i

CONTENTS

INTRODUCTION

Zero reset:

This refers to setting the reference value to "0" or any desired numeric value so that the measured value can be displayed and output as a positive or negative deviation (tolerance) from the reference value. The measured value can be set to "0" or any desired numeric value at any timing in the RUN mode.



Procedure for setting up zero reset

	1	Set to the MENU mode	
	2	Zero reset memory setting	
CONTENTS	3	Display setting at zero reset	
INTRODUCTION	4	Return to RUN mode	
	5	Zero reset execution	
PREPARATION		Setting completed	

PREPARATION For Measurement

1

Set to the MENU mode

2 Zero reset memory setting

FLOW OF				
OPERATION	Button Operation	Display	Description of Operation	Explanation of Selection Menu
BASIC SETUP	SMART MENU/SET Hold down for 3 seconds	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.	
APPLICATIONS & SETTING METHODS Height	Press to display.	dELRI L 888888	Press the 🏶 button to display dEERI L.	* This step is not required if detail menu display is already set to ON in the MENU mode.
Steps and Warpage Double Sheet Detection	Press to display.	<u>dELRI L</u> ON	Press the button to set the display to □N to set display of the detail menu.	
Thickness	SMART MENU/SET		Press the button to apply the setting.	

Positioning

Eccentricity and Surface Deflection

D Si

TF Sł

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SE TR CH

Select whether or not to hold the measured value after the zero reset was performed when the power is turned OFF.

	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SETTINGS TROUBLE- SHOOTING	Press to display.	ZRMEM	Press the I button to display ZRMEM .	Default value: OFF
SPECIFI- CATIONS		ZRMEM OFF	Press the 💲 button to select the zero reset memory setting.	Saves the current measured result.
NDEX	Press to select	Select the desired value.		Does not save the current measured result.
Setting Transition Charts				When executing a zero reset at each measurement, set to

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Button Operation	Display	Description of Operation	Explanation of Selection Menu	
SMART MENU/SET		Press the button to apply the setting.		CONTENTS

Important

3

Button

Operation

SMART MENU/SET

Display setting at zero reset

Display

Set any value.

. If zero reset memory is set to ON, the zero reset level will be written in the Amplifier Unit's non-volatile memory (EEPROM) each time a zero reset is executed.

PREPARATION FOR MEASUREMENT The EEPROM can be written a maximum of 100,000 times. Writing the zero reset level for each measurement can, therefore, use up the life of the memory and lead to malfunctions.

Description of Operation

Press the \$ button to display

Press the

 button to enable

Press the **()** button to move

the digit, press the 🕱 button to

change the numeric value, and

Press the button to apply

set the offset level.

the setting.

setting of values at a reset.

7RHI 5P.

Set the zero reset memory function to set the

Explanation of

Selection Menu

* If the 🔹 button is pressed

button is pressed when the

cursor is at the left-most digit,

the setting will be canceled.

when the cursor is at the

right-most digit or the 🔇

Default value: 0.000

reference value to any numeric value.

FLOW OF OPERATION

INTRODUCTION

BASIC SETUP

	MAIN APPLICATION & SETTING
)	METHODS
_	Hoight

Heign

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-

Δ Return to RUN mode

Button	Display	Description of Operation	Explanation of	SHOOTING
Operation	Display		Selection Menu	SPECIFI-
SMART MENU/SET	Out	Hold down the button for three seconds to switch to the		CATIONS
Hold down for 3 seconds	H L MENU	RUN mode.		INDEX

SETTING TRANSITION CHARTS

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5 Zero reset execution

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	_	_	Set the sensing object to be used for executing the zero reset.	
PREPARATION FOR MEASUREMENT			or input the zero reset signal (4	(For details on external inputs, see page 118.)
FLOW OF OPERATION	Hold both down for 1 second	888888	ms to 1 s) from an external device.	

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Def

D S

TF SI

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IN

SE TR CI

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Important

- The minimum display value is -99.999, and the maximum display value is 999.999. If the measured value is below the minimum value after execution of zero reset, -99.999 will be displayed. 999.999 will be displayed if the measured value is above the maximum value. Zero reset can be executed only if the measured value is within ±10% of the rated measurement range.
 - · Even if a zero reset is executed, the threshold does not change from the setting before execution of the zero reset.

(For example, even if a zero reset is executed so that the measured value 2 becomes 0, the HIGH threshold stays at 5 if it is 5 before zero reset is executed.)

· After a zero reset, analog values are output in a range that corresponds to the zero-reset display value (initial value: 0 mm), which accords with the zero-reset distance point. (When the zero-reset display is 0 mm and scaling is set to OFF, the analog output value will be 3 V if the range is 1 to 5 V, 0 V if the range is -5 to 5 V, and 12 mA if the range is 4 to 20 mA.)

Procedure for canceling a zero reset

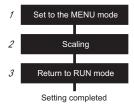
	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SETTINGS IROUBLE- SHOOTING	Hold both down for 1 second Hold both down for 1 second	 888888	Either press the 💲 button for one second in the RUN mode, or input the zero reset signal (3 s or more) from an external	
SPECIFI- CATIONS			device.	<u>. </u>
NDEX				
Setting Transition Charts				

Scaling

Scaling:

The display scale can be changed when you want to display a digital value on the Amplifier Unit different from the actual measured value. (For example, when you want to set the measured value as the actual measuring distance.)

Procedure for setting up scaling



1 Set to the MENU mode

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Height Steps
SMART MENU/SET	Lit	Hold down the button for		and Warpage
Hold down for 3 seconds	H L MENU	three seconds to switch to the MENU mode.		Double Sheet Detection
Press to displa	<u>dELAI L</u>	Press the 🏶 button to display dELRI L.	* This step is not required if detail menu display is already set to ON in the	Thickness
aș.			MENU mode.	Positioning
Press to display.	<u>dELRI L</u> ON	Press the ♣ button to set the display to □N to set display of the detail menu.		Eccentricity and Surface Deflection
SMART MENU/SET		Press the button to apply the setting.	-	DETAILED SETTINGS

2 Scaling

Button Operation	Display	Description of Operation	Explanation of Selection Menu	SPECIFI- CATIONS
Press to day	<u>SCALE</u>	Press the 🌒 button to display SERLE.	Default value: OFF	INDEX
V V				SETTING TRANSITION CHARTS

TROUBLE-

SHOOTING

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

	Button Operation	Display	Description of Operation	Explanation of Selection Menu
CONTENTS	Press to display.	<u>SCALE</u> ON	Press the 拳 button to display □N.	
INTRODUCTION	SMART MENU/SET		Press the button to enable setting of scaling.	
Preparation For Measurement	Press to display.	<u>5 I-6EF</u> -99999	Press the 🌒 button to display 5 I-BEF .	<to actual="" display="" distance="" sensing="" the=""></to>
FLOW OF OPERATION BASIC			Press the 🏶 button to enable setting of S1-Before.	-8 0 8 + 58 50 42
SETUP	IChange numeric value		Press the 👀 button to move	
MAIN APPLICATIONS & SETTING METHODS	Press to set.	-8000 [Numeric	the digit, press the button to move change the numeric value, and set the measured value before	58 After
Height		value before change]	S1 is changed.	8 Before
Steps and Warpage		Set any value.	Press the 👅 button to apply	S1 S2
Double	SMART MENU/SET		the numeric value of S1-Before.	* If the \$ button is pressed when the cursor is at the
Detection	Press to display.	<u>5 -AFE</u> -99999	Press the 🏼 button to display 5 I-RFE .	right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled.
Positioning			Press the s button to enable	
Eccentricity and Surface Deflection			setting of S1-After.	_
DETAILED SETTINGS	[Change numeric value]	5 - 95 - 58,000 [Numeric	Press the (**) button to move the digit, press the (**) button to change the numeric value, and set the measured value after S1	
TROUBLE- SHOOTING		value after change] Set any value.	is changed.	
SPECIFI- CATIONS	SMART MENU/SET		Press the 👅 button to apply the numeric value of S1-After.	
INDEX			·	
SETTING TRANSITION CHARTS				

Button Operation	Display	Description of Operation	Explanation of Selection Menu			
Press to display.	<u>52-66F</u>	Press the 🌢 button to display 52-666 .	58 After	CONTENTS		
		Press the 🏶 button to enable setting of S2-Before.	8 Before	INTRODUCTION		
[Change numeric value]	52-66F	Press the 🐝 button to move the digit, press the 3 button to	* If the \$ button is pressed when the cursor is at the	PREPARATION FOR MEASUREMENT		
Press to set.	[Numeric value before change] Set any value.	change the numeric value, and set the measured value before S2 is changed.	right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled.	FLOW OF OPERATION		
SMART MENU/SET		Press the button to apply the numeric value of S2-Before.		BASIC SETUP		
Press to display.	52-AFE -99999	Press the 🌒 button to display 52-RFL .		MAIN APPLICATIONS & SETTING METHODS		
		Press the 🏶 button to enable setting of S2-After.		Height Steps and Warpage		
[Change numeric value]	52-RFL	Press the \$ button to move the digit, press the \$ button to		Double Sheet Detection		
Press to set.	[Numeric value after change] Set any value.	change the numeric value, and set the measured value after S2 is changed.		Thickness		
SMART MENU/SET		Press the button to apply the numeric value of S2-After.		Positioning		
3 Return to RUN mode						

3 **Return to RUN mode**

Button Operation	Display	Description of Operation	Explanation of Selection Menu	DETAILED SETTINGS
SMART MENU/SET Hold down for 3 seconds	Out	Hold down the button for three seconds to switch to the RUN mode.		TROUBLE- SHOOTING

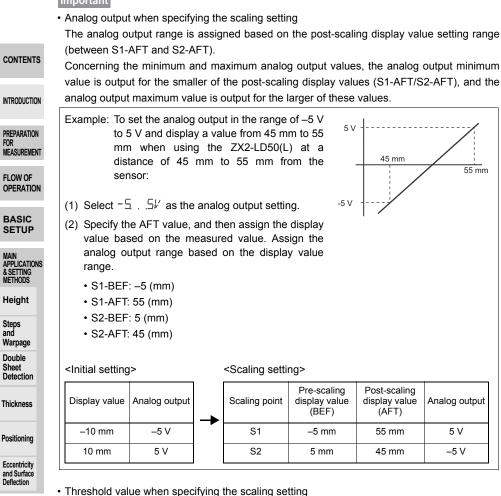
SPECIFI-CATIONS

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SETTING TRANSITION CHARTS

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Important



Even if scaling is executed, the threshold does not change from the setting before execution

of scaling. (For example, the HIGH threshold stays at 5 if it was 5 before scaling is executed.)

Detailed Settings

TROUBLE-SHOOTING

SPECIFI-CATIONS

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SETTING TRANSITION CHARTS

108 Scaling

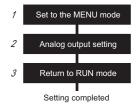
Analog Output

Analog output:

This refers to the conversion of measurement results to 4 to 20 mA current output or to -5 to +5 V/1 to 5 V voltage output.

The relationship between display values and analog output values can be freely INTRODUCTION specified. (Monitor focus)

Procedure for setting up analog output





Button Operation	Display	Description of Operation	Explanation of Selection Menu	Steps and Warpage
SMART MENU/SET		Hold down the button for three seconds to switch to the		Double Sheet Detection
Hold down for 3 seconds	H L MENO	MENU mode.		Thickness

2 Analog output setting

Button Operation	Display	Description of Operation	Explanation of Selection Menu	Eccentricity and Surface Deflection
Press to display.	<u>8-005</u>	Press the ♦ button to display 用一□凵上.	Default value: -5 to +5 V	DETAILED SETTINGS
		Press the 💲 button to select analog output.	H_20MA Current output 4 to 20 mA	TROUBLE- SHOOTING
Press to select	Select the desired value.		$\frac{1}{5}$ Voltage output 1 to 5 V -5, 5/	SPECIFI- CATIONS
			Voltage output 5 to +5 V	INDEX
SMART MENU/SET		Press the button to apply the setting.		SETTING
				TRANSITION

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	Button Operation	Display	D	escription of	Operation		nation of on Menu	
CONTENTS	SMART MENU/SET		Hold	down the 👅	button for			
INTRODUCTION	Hold down for 3 seconds	Out		e seconds to s mode.	witch to the			
PREPARATION		-		-		s and analog	output values	
FOR	(equivalent to				,			
FLOW OF OPERATION	 To specify any analog output value for a display value, assign the analog output range and the minimum and maximum analog output values by selecting the analog output and then setting up scaling. 							
BASIC SETUP	(If scaling is i	not set up, the i	meas	urement range	is the same a	is the analog o	utput range.)	
Reality	0	1 0		ned based on	the post-scali	ng display val	ue setting range	
MAIN APPLICATIONS & SETTING METHODS	Concerning t		nd ma			-		
Height		ut for the small t maximum val					2-AFT), and the	
Steps and Warpage	To only speci	fy the analog o	utput	range, withou	t changing disp	olay values		
Double Sheet Detection	wh	set the analog nen using the Z 55 mm from the	X2-L[D50(L) at a dis				
Thickness	(1) Select -	5,5⊬ as the	analo	og output settir	ıg.	_5 mm	5 mm	
Positioning	AFT val	he measureme ues, and then the measured	assi	gn the analog			5 V	
Eccentricity and Surface Deflection		⁼ : –5 (mm) ⁻ : –5 (mm) → S	et the	same value a	s S1-BEF			
DETAILED SETTINGS	• S2-BEF • S2-AF1	⁼ : 5 (mm) ⁻ : 5 (mm) → Se	t the s	same value as	S2-BEF			
TROUBLE-	<initial setting<="" th=""><th>g></th><th></th><th><scaling settir<="" th=""><th>ng></th><th></th><th></th></scaling></th></initial>	g>		<scaling settir<="" th=""><th>ng></th><th></th><th></th></scaling>	ng>			
SHOOTING SPECIFI-	Display value	Analog output		Scaling point	Pre-scaling display value (BEF)	Post-scaling display value (AFT)	Analog output	
CATIONS	–10 mm	–5 V	-	S1	–5 mm	–5 mm	–5 V	
INDEX	10 mm	5 V		S2	5 mm	5 mm	5 V	
	To specify the	e analog output	t rang	e after changi	ng display valu	ies		
SETTING TRANSITION CHARTS	(For details	on scaling, se	e pag	je 108.)				

Output for Non-measurement | Setting channels used when connecting multiple units: Each CH

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Steps and

Warpage Double

Sheet Detection

Thickness

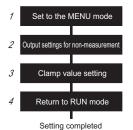
Output for non-measurement:

CONTENTS This refers to specifying the output contents when an error occurs (Error-dark or Error-bright), when a reset is being input, or before measured values are finalized.

(For details on these errors, see page 130.)

Selection Menu	Output Contents				
Selection Menu	Judgment Output	Analog Output		PREPARATION	
KEEP (Default)	The measurement value immediately before the non-measurement state is entered is all and output.				
CLAMP	All OFF	The specified CLAMP value is output. The following options are available. • For voltage output: -5.00 to 5.00 V (in 1-V steps), or		FLOW OF OPERATION	
		 the maximum (approximately 5.5 V) For current output: 4.00 to 20.00 mA (in 1-mA steps), or the maximum (approximately 22 mA) 		BASIC SETUP	

Procedure for setting up output for non-measurement



Set to the MENU mode

Button	Display	Description of Operation	Explanation of	Positioning
Operation	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.	Selection Menu	Eccentricity and Surface Deflection
Pres b daplay.	delai L	Press the & button to display dEERI L.	* This step is not required if detail menu display is already set to ON in the MENU mode.	SETTINGS TROUBLE- SHOOTING
Press to display.	<u>delai l</u> On	Press the button to set the display to □N to set display of the detail menu.		SPECIFI- CATIONS
SMART MENU/SET		Press the button to apply the setting.		SETTING TRANSITION

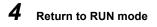
CHARTS

2 Output settings for non-measurement

CONTENTS	Button Operation	Display	Description of Operation	Explanation of Selection Menu
INTRODUCTION	Press to display	RSEDUE	Press the I button to display RSEDUE -	Default value: KEEP
PREPARATION For Measurement		RSEQUE KEEP	Press the 💲 button to select output for non-measurement.	KEEP The measured value status before measurement is
FLOW OF OPERATION	Press to select	Select the desired value.		stopped is held and output.
BASIC SETUP				Analog output: The preset clamp value is output.
MAIN APPLICATIONS & SETTING METHODS	SMART MENU/SET		Press the button to apply the setting.	
Height	-			

3 Clamp value setting

Steps	3 Clam	o value setting	I	
Warpage Double Sheet	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Detection			Press the 🕸 button to display	Default value: MAX
Thickness	Press to display	<u> </u>	CLAMP.	The clamp value is output
Positioning				from when the power is turned on until the measured value is finalized, even when
Eccentricity and Surface Deflection				KEEP is selected, so be sure to set this value.
DETAILED SETTINGS		<u> </u>	Press the 💲 button to display the clamp value.	For voltage output:
TROUBLE- SHOOTING	Press to select	Select the desired value.		MAX For current output:
SPECIFI- CATIONS				In 1 mA units
INDEX	SMART MENU/SET		Press the button to apply the setting.	
SETTING TRANSITION CHARTS				



Button Operation	Display Description of Operation		Explanation of Selection Menu	CONTENTS
SMART MENU/SET	Out	Hold down the button for three seconds to switch to the		CONTENTS
Hold down for 3 seconds	H L MENU	RUN mode.		INTRODUCTION

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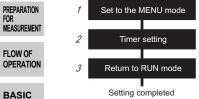
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Timer

CONTENTS Th

The timing for judgement outputs can be adjusted to match the operation of external devices. (Timer accuracy: Up to 1 ms)

NTRODUCTION Procedure for setting up the timer



1

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MAIN

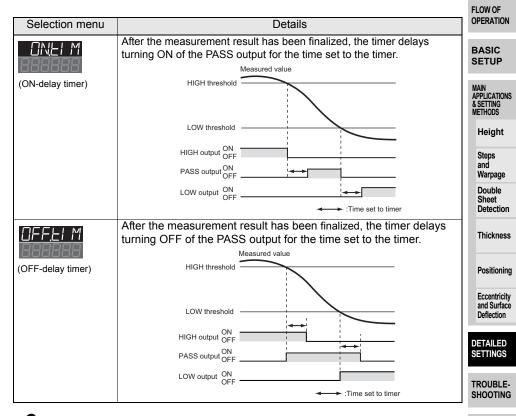
Set to the MENU mode

APPLICATIONS & SETTING	Button			Explanation of
METHODS	Operation	Display	Description of Operation	Selection Menu
Height	SMART MENU/SET	Lit	Hold down the 🖱 button for	
Steps and Warpage	Hold down for 3 seconds	H L MENU	three seconds to switch to the MENU mode.	
Double Sheet Detection	Press to display.	<u>dELRI L</u> 888888	Press the \$ button to display dELRI L.	* This step is not required if detail menu display is already set to ON in the MENU mode.
Positioning		delai L On	Press the 拳 button to set the display to ☐N to set display of the detail menu.	
Eccentricity and Surface Deflection	Press to display.		Press the to apply the setting.	

2 Timer setting

TROUBLE- SHOOTING	Button Operation	Display	Description of Operation	Explanation of Selection Menu
SPECIFI- CATIONS	Press to display,	Select the	Press the the button to display DNLI M when setting the ON- delay and DFFLI M when setting the OFF-delay.	ON-delay timer OFF-delay timer (For details, see the
INDEX		desired value.		following page.)
SETTING TRANSITION CHARTS			Press the sutton to enable setting of the timer.	

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
[Change numeric value]		Press the 👀 button to move	OMS to IOOOMS	
Move digit]		the digit, press the substant to change the numeric value, and set the time set to the timer.	* If the \$ button is pressed when the cursor is at the right-most digit or the \$	CONTENTS
Press to set.			button is pressed when the cursor is at the left-most digit,	INTRODUCTION
			the setting will be canceled.	
SMART MENU/SET		Press the button to apply the setting.		PREPARATION FOR MEASUREMENT



3 Return to RUN mode

Button Operation	Display	Description of Operation	Explanation of Selection Menu	INDEX
SMART MENU/SET Hold down for 3 seconds	Uut H L MENU	Hold down the button for three seconds to switch to the RUN mode.		SETTING TRANSITION CHARTS

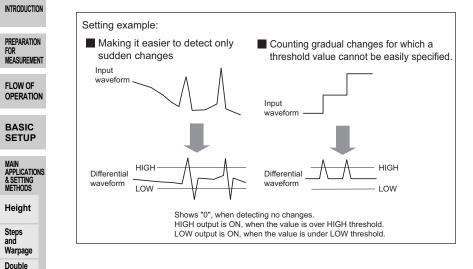
SPECIFI-CATIONS

Setting the Differential Function

Setting channels used when connecting multiple units: Each CH

Differential function:

This function is used to display measurement change amounts when it is difficult to specify a threshold for the measured value, making it easier to detect only sudden changes in the measured values.



· The detection effectiveness varies depending on the response time setting.

Description of Operation

Hold down the 👅 button for

three seconds to switch to the

MENU mode.

Procedure for setting up differential function

Set to the MENU mode

Differential function

setting

Return to RUN mode

Setting completed

Set to the MENU mode

Display

MENU

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1

Button

Operation

MENU/SET

Hold down for 3 seconds

Detection Thickness

Sheet

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- Positioning

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SETTING TRANSITION CHARTS

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Setting the Differential Function

Ч Ξ Explanation of

Selection Menu

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
Press to display.	dELRI L 888888	Press the I button to display dELRI L.	* This step is not required if detail menu display is already set to ON in the MENU mode.	CONTENTS
	delai L DN	Press the ♥ button to set the display to □N to set display of the detail menu.		INTRODUCTION
Press to display.		Press the button to apply		PREPARATION FOR MEASUREMENT
		the setting.		FLOW OF OPERATION

2 Differential function setting

Button Operation	Display	Description of Operation	Explanation of Selection Menu	SETUP		
Press to a		Press the 🌢 button to display 네 FF .		MAIN APPLICATIONS & SETTING METHODS		
to display.				Height		
	di FF NN	Press the 拳 button to set the display to □N .		Steps and Warpage		
Press to display.				Double Sheet Detection		
SMART MENU/SET		Press the button to apply the setting.		Thickness		

3 Return to RUN mode

SMART MENUSET Hold down the button for three seconds to switch to the	Button Operation	Eccentricity and Surface Deflection
Hild down for 3 seconds RUN mode.	Hold down for	DETAILED SETTINGS

Positioning

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External Input for Bank, Timing Input, Reset Input

Setting channels used when connecting multiple units: Each CH, Bank switching: CH1

External input:

This refers to inputting the bank switching signal, the timing signal during a hold and the reset signal from an external device to execute these operations.

PREPARATION FOR MEASUREMENT

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Procedure for setting up external input Set to the MENU mode 1 2 External input terminal setting 3 Return to RUN mode Setting completed

Set to the MENU mode

Steps and Warpage	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Double Sheet Detection	SMART MENU/SET Hold down for 3 seconds	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.	
Thickness	P	dEE81 L	Press the 🕸 button to display	* This step is not required if
Positioning	Press to display.		סבבחי ב.	detail menu display is already set to ON in the MENU mode.
Eccentricity and Surface Deflection		<u>delai l</u> On	Press the ♥ button to set the display to □N to set display of the detail menu.	
DETAILED SETTINGS	Press to display.			
TROUBLE- SHOOTING	SMART MENU/SET		Press the button to apply the setting.	

Description of Operation

SPECIFI-CATIONS 2

Button

Operation

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SETTING TRANSITION CHARTS

External input terminal setting

Display

Explanation of

Selection Menu

Default value: TIM.RST

INTRODUCTION Note: When the mutual interference prevention function is being used, external input cannot be used.

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
Press to select	EXE-IN LI MRSE Select the	Press the 💲 button to select the external input terminal.	LI MRSE timing input/reset input BRNK Bank switching	CONTENTS
SMART MENU/SET	desired value.	Press the 👅 button to apply		INTRODUCTION
		the setting.		PREPARATION FOR MEASUREMENT

3 Return to RUN mode

Button	Display	Description of Operation	Explanation of	OPERATION	
Operation		ay		Selection Menu	BASIC
SMART MENU/SET		Out	Hold down the 🖱 button for		SETUP
			three seconds to switch to the		
Hold down for 3 seconds	ΗL	MENU	RUN mode.		MAIN APPLICATION

Procedure for executing external input

Each of the functions is executed when signals are input using the external input wire in table 1 below.

Timing input, reset input and bank switching are executed by a signal input of 4 ms or more. While the signal in table 2 below is being input, measurement is performed based on the settings of the specified bank.

When connecting two or more Amplifier Units, use the CH1 Amplifier Unit for bank switching. The banks of the Amplifier Units of CH2 and later are switched together with CH1.

Table 1 External Input Wiring

Amplifier Unit Connector Cable Color Setting	Purple	Red
EI MRSE	Timing input	Reset input
6ANK	BANK input 0	BANK input 1

Table 2 Bank Signal Switching Wiring

	BANK Input 0 (purple)	BANK Input 1 (red)
BANK 0	OFF	OFF
BANK 1	ON	OFF
BANK 2	OFF	ON
BANK 3	ON	ON

Bank signal switching is enabled only in the RUN mode. Note:

NS METHODS

Height

Steps and Warpage

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DETAILED SETTINGS

TROUBLE-SHOOTING

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Setting the Detection Surface Selection

Setting channels used when connecting multiple units: Each CH

Measurement performed with

correct reflection components

(with the MAX setting)

Detection surface selection:

Sensor Head

Measurement

while moving

Correct reflection --- Multireflection

The default value is FIRST. Setting the value to MAX can decrease incorrect measurements caused by diffused reflection or multireflection due to the shape of the workpiece.

Correct

Measurement performed on

(with the FIRST setting)

Multireflection

the NEAR side

NEAR

Procedure for setting up detection surface selection

reflection

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Eccentricity and Surface	Button Operation	Display	Description of Operation	Explanation of Selection Menu
Deflection DETAILED SETTINGS	SMART MENU/SET Hold down for 3 seconds	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.	
TROUBLE- SHOOTING	Press to display.	dELRI L 888888	Press the 🌢 button to display dEERL	* This step is not required if detail menu display is already set to ON in the MENU mode.
SPECIFI- CATIONS	Press to display.	<u>delri l</u> On	Press the 拳 button to set the display to ☐N to set display of the detail menu.	
SETTING TRANSITION	SMART MENU/SET		Press the button to apply the setting.	-

CHARTS

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Detection surface 2 selection setting 3 Return to RUN mode Setting completed

Set to the MENU mode

2 Detection surface selection setting

Button Operation	Display	Description of Operation	Explanation of Selection Menu	_
Press to display,	<u>dELECL</u> 888888	Press the 🌢 button to display dELEEL .		
Press to select	Select the desired value.	Press the button to display MRX.	FIRSE During normal measurement MRX When an incorrect measurement occurs due to diffused reflection or multireflection	PREPARATION FOR MEASUREMENT FLOW OF OPERATION
SMART MENU/SET		Press the button to apply the setting.		BASIC SETUP
3 Return to RUN mode				

3 Return to RUN mode

	Button	Diard		Description of Opportunity	Explanation of	Height
-	Operation	Displ	ay	Description of Operation	Selection Menu	Steps and
s	MART MENU/SET			Hold down the 👅 button for		Warpage
(Hold down for 3 seconds	□ □ H L	Out MENU	three seconds to switch to the RUN mode.		Double Sheet Detection

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Key Lock Function

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Key Lock Function:

CONTENTS The key lock function disables all keys. Once keys have been disabled, no key input will be accepted until the lock is released. This function is useful for preventing inadvertent changes to settings.

(Although button operations are disabled, external input is still possible.)

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= ION	Button Operation	Display	Description of Operation	Explanation of Selection Menu
;	Hdd bein dawn fe 3 second 1 second Hdd bein dawn fe 3 second	888888 K-LOCK	Hold both the (a) buttons down for three seconds in the RUN mode.	

Canceling the Key Lock

ige	Button Operation	Display	Description of Operation	Explanation of Selection Menu
le tion	Hdd berh do		Hold both the (**) buttons down for three seconds in the RUN mode.	
ess	s n fr	Displayed until completion of cancellation		

Initializing Settings Data Setting channels used when connecting multiple units: Each CH

Initialization: This function resets all settings to their default values.

Default Values

Function	Default Value	INTRODUCTION
Display	0 reference: Measurement center distance	
	+ indication: NEAR side	PREPARATION FOR
	- indication: FAR side	MEASUREMENT
HIGH threshold	Measurement range maximum value	FLOW OF
LOW threshold	Measurement range minimum value	OPERATION
Response time	500 ms	D.4.010
Analog output setting	–5 to +5 V	BASIC SETUP
Detail menu display selection	OFF	MAIN
Bank switching settings	0	& SETTING METHODS
Mutual interference prevention	OFF	Height
Hysteresis width	0.000	Steps and
Two-Sensor operation	OFF	Warpage
setting		Double Sheet
Thickness setting	0.000	Detection
Measured value display scaling	OFF	Thickness
Differential function	OFF	Positioning
Hold setting	OFF	_
Trigger mode	TIMING (self-trigger timing input)	Eccentricity and Surface
Self-trigger level	0.000	Deflection
Output for non- measurement	KEEP	DETAILED SETTINGS
Clamp value	MAX	
ON-delay time	0 ms	TROUBLE- SHOOTING
OFF-delay time	0 ms	
Zero reset memory	OFF	SPECIFI- CATIONS
Display during zero reset	0.000	
External input terminal setting	TIM.RST (timing input/reset input)	
Detection surface selection	FIRST	TRANSITION CHARTS

Procedure for initializing settings data



Important

1

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OPERATION

 When connecting two or more Amplifier Units, use CH1 to perform initialization because CH2 and later channels cannot be used to do this.

Note that CH2 and later channels are initialized together with CH1.

Set to the MENU mode

BASIC SETUP	Button Operation	Display	Description of Operation	Explanation of Selection Menu
MAIN APPLICATIONS & SETTING METHODS	SMART MENU/SET	Lit H L MENU	Hold down the button for three seconds to switch to the MENU mode.	
Height	3 seconds		MENU Mode.	

2 Setting data initialization

Warnana						
Warpage Double Sheet Detection	Button Operation	Display	Description of Operation	Explanation of Selection Menu		
Thickness	Press to deplay	<u> NI E</u> 888888	Press the I button to display			
Positioning	×		-			
Eccentricity and Surface Deflection	Press to display.	EXE	Press the \Leftrightarrow button to display $E \times E$.			
DETAILED SETTINGS	SMART MENU/SET	<u> N E</u>	Press the 🖱 button.			
TROUBLE- Shooting	HORE GOWIT	Displayed 1 digit at a time				
SPECIFI- CATIONS		I NI E	When 🛛 🕂 is displayed, this means that initialization is completed.			
INDEX			P	L		

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3 Return to RUN mode

Button Operation	Display	Description of Operation	Explanation of Selection Menu	
SMART MENU/SET		Hold down the button for three seconds to switch to the		CONTENTS
Hold down for 3 seconds	H L MENU	RUN mode.		INTRODUCTION

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Troubleshooting

CONTENTS

This section describes countermeasures for temporary hardware problems. Check the malfunction in this section before sending the hardware for repair.

INTRODUCTION	Category	Problem	Probable cause and possible countermeasure	Pages
PREPARATION		The device restarts during operation.	 Is the power supply device connected correctly? Are the Calculating Units connected correctly?	p.30 p.26
MEASUREMENT		No input signal is received.	Are all cables connected correctly?Is the input signal line disconnected?	p.30
OPERATION		The measured values fluctuate and are not stable	This problem may be due to temperature characteristics. Execute zero reset periodically using	p.101
BASIC SETUP	Operation	depending on day and time.	the standard object to correct this problem.	
MAIN	pera	Laser light is not emitted.	Is the LD-OFF input short-circuited?	p.30
APPLICATIONS & SETTING METHODS	ō	Bank switching by signals from the external input terminal is not functioning.	 Is the external input terminal set to <u>LANK</u>? Is the cable connected correctly? 	p.118 p.30
Height		The state returns to	• Is the external input terminal set to 21 MR52?	p.118
Steps and Warpage Double		bRNK ☐ in the RUN mode even if after a bank is switched by button		
Sheet Detection		operation. The main display stays at	Has a timing input been made while hold is enabled	p.93
Thickness		[].	 and the trigger mode is <i>L M N C</i>? If the hold function is enabled and the trigger type is <i>SELF-U</i> or <i>SELF-d</i>, has the self-trigger level been set to an appropriate value? 	p.95
Positioning Eccentricity and Surface Deflection	splay	An abnormal distance is displayed when the object is clearly outside the measurement range.	This problem may occur due to the characteristics of the sensor. Make sure that the distance to the sensing object is appropriate.	_
DETAILED SETTINGS		Display	LddlWN is displayed on the sub-display when the power is turned ON.	The laser of the Sensor Head has deteriorated. Replace the Sensor Head.
TROUBLE- SHOOTING	Ω	Ld∏FF is displayed on the sub-display.	Is the LD-OFF input short-circuited?	p.30
SPECIFI-		LI MI N⊑ is displayed on the sub-display.	Is the timing input short-circuited?	p.30
CATIONS		RESEL is displayed on the sub-display.	Is the reset input short-circuited?	p.30
INDEX		Even though the installation conditions are	Is the zero-reset input short-circuited?	p.30
SETTING TRANSITION CHARTS		the same, measured values differ considerably.		

Category	Problem	Probable cause and possible countermeasure	Pages	
olay	E - BRGE is displayed on the main display	 Is the distance between the Sensor Head and the workpiece within the measurement range? 	p.139	CONTENTS
Display	E - dRK is displayed on the main display.	Is the distance between the Sensor Head and the workpiece within the measurement range?	p.139	1
	Judgements are not output to external devices.	Are all cables connected correctly?Is the output signal line disconnected?	p.30	INTRODUCTION
Output		 Is the reset input short-circuited? Is the HIGH threshold set to a value larger than the LOW threshold? 		PREPARATION FOR MEASUREMENT
	Analog output levels are strange.	Are the analog output settings correct?	p.109	FLOW OF OPERATION

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Error Messages

CONTENTS

This section outlines the error messages displayed on the Amplifier Unit and the countermeasures for those messages. While displaying an error, the error output signal is also output. (There are some

INTRODUCTION			
	Display	Error	Countermeasure
PREPARATION	Error-bright	Saturated light amount intensity,	Install so that the distance between
FOR MEASUREMENT	<u>E-6865</u>	measurement error.	the Sensor Head and the
MERGONEMENT	888888	(The error output signal is not output.)	workpiece is within the
FLOW OF			measurement range.
OPERATION	Error-channel	 There is only one Amplifier Unit 	If two or more Amplifier Units have
	E-CH	even though mutual interference	been installed, turn OFF the power
BASIC		prevention is set to ON.	supply and check that the Amplifier
SETUP		There is only one Amplifier Unit	Units and Calculating Units are
		even though two-Sensor operation	connected correctly.
MAIN APPLICATIONS		is set to ON.	 If only one Amplifier Unit is being
& SETTING METHODS	Error-channel	Two Amplifier Unit communication	used, connect another Amplifier
	E-CH	error.	Unit temporarily and turn OFF
Height	50		mutual interference prevention and
Steps			two-Sensor operation, or initialize
and			the setting data.
Warpage	Error-dark	Insufficient received light intensity,	Install so that the distance between
Double Sheet	E-988K	measurement error.	the Sensor Head and the
Detection	888888	(The error output signal is not output.)	
			measurement range.
Thickness	Error-head	The Sensor Head is disconnected.	Turn OFF the power supply, check
	<u>E-HERd</u>	Or, a sensor communications error	the Sensor Head connection, and
Positioning	COMO I	has occurred.	then turn ON the power supply
rosidoning	Error-head		again.
Eccentricity	E-HERd		 If the above countermeasure does
and Surface Deflection	50M03		not solve the problem, the Sensor
Denection	Error-head		Head is malfunctioning. Replace the Sensor Head.
DETAILED	E-HERd		the Sensor Head.
SETTINGS	E0M03		
	Error-head	Sensor Head laser error.	
TROUBLE-	E-HE8d		
SHOOTING	LdO I		
	Error-head	The Sensor Head internal memory is	

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exceptions.)

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E-HERd

MEMOT Error-head

> E-HERd MEMO2

in error.

Display	Error		Countermeasure	
Error-head <u>E-HERd</u> SYSD 1	Sensor Head system error.	•	Turn OFF the power supply, check the Sensor Head connection, and then turn ON the power supply	
Error-head		•	again. If the above countermeasure does	CONTENTS
Error-head			not solve the problem, the Sensor Head is malfunctioning. Replace the Sensor Head.	INTRODUCTION
<u>E-KERd</u> 53503				PREPARATION FOR
Error-head	Because the Sensor Head version is	•	Contact the company with which	MEASUREMENT
<u>E-HERA</u> VER	old, the connected Amplifier Unit cannot be used.		your company is doing business or the OMRON sales representative handling your company.	FLOW OF OPERATION
Error-memory	Amplifier Unit setting memory error.	•	Turn OFF the power supply, check if wiring is connected correctly, and then turn ON the power supply	BASIC SETUP
		•	again. If the above countermeasure does not solve the problem, the	MAIN APPLICATIONS & SETTING METHODS
			Amplifier Unit is malfunctioning. Replace the Amplifier Unit.	Height
Error-memory E-MEM	Amplifier Unit setting memory error.	•	Initialize the settings by holding down the SET key for at least three seconds.	Steps and Warpage
		•	If the above countermeasure does not solve the problem, the	Double Sheet Detection
			Amplifier Unit is malfunctioning. Replace the Amplifier Unit.	Thickness
Error-short	One or all of the judgment outputs are short-circuited.	•	Turn OFF the power supply, check that the HIGH, PASS, LOW or error output lines are not short-	Positioning
			circuited, then turn ON the power supply again.	Eccentricity and Surface Deflection
Error-system	Amplifier Unit system error.	•	Turn OFF the power supply, check if wiring is connected correctly, and then turn ON the power supply again.	DETAILED SETTINGS
		•	If the above countermeasure does not solve the problem, the Amplifier Unit is malfunctioning. Replace the Amplifier Unit.	TROUBLE- SHOOTING
Tuning-failed	Smart Tuning failed.	•	Change the response time setting	SPECIFI- CATIONS
<u>EUN ING</u> FR ILEd	(The error output signal is not output.)	•	to a larger value, and try again. Make sure that the distance between the Sensor and	INDEX
			Workpiece is within the measurement range, and try again.	SETTING TRANSITION CHARTS

	Display	Error	Countermeasure
	LD.down	The laser of the Sensor Head has	Replace the Sensor Head.
	888888	deteriorated.	
	LddOwn		
CONTENTS		Measured values are not output	Normally, measured values are
	888888	because the reset signal is being input, calculations are in progress,	displayed once they can be output.
INTRODUCTION		timing is before the hold sampling	
		time, etc.	
PREPARATION		(The error output signal is not output.)	
FOR MEASUREMENT			
WEAJUKEWENT			
FLOW OF			
OPERATION			
BASIC SETUP			
52151			
MAIN APPLICATIONS & SETTING METHODS			
Height			
Steps			
Steps and Warpage			
Double			
Sheet			
Detection			
Thickness			
Desitioning			
Positioning			
Eccentricity			
and Surface Deflection			
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TROUBLE- SHOOTING			
onconing			
SPECIFI-			
CATIONS			
INDEX			
SETTING			
TRANSITION			
GHARIS			
132	Error Message	25	ZX2 User's Manual

Question	Answer	CONTENTS	
What is the positional variation range with	The range is $\pm 0.5^{\circ}$ of the ideal emitter axis in		
respect to the machine axis of the emitter beam spot?	the dimensional drawing on page 138.	INTRODUCTION	
After the response time is changed, is it necessary to re-execute smart tuning?	Yes. After the response time is changed, the smart tuning results are cleared. Therefore, re-execute tuning.	PREPARATION FOR MEASUREMENT	
If using a different bank for the first time, is it necessary to execute smart tuning?	e, is it Yes. The smart tuning results are not applied to other banks. If using a different bank for the first time, execute smart tuning.		
For the line beam type, is it possible to detect beam-spot-internal steps?	Spot-internal steps cannot be measured. Use the line beam spot so that it is at only one height.	BASIC SETUP	
Is it possible to add additional extension cables between the Sensor Head and Amplifier Unit?	Regardless of the length, only one extension cable can be added. It is not possible to add multiple extension cables.	MAIN APPLICATIONS & SETTING METHODS	
About how much signal input and open time is required for each input operation?	These times can be checked using the timing charts in this manual (on page 144).	Height	
Can calculations be performed when Sensor Heads that have different measurement	Yes. This is possible without specifying any special settings.	Steps and Warpage	
ranges are connected to two Amplifier Units? How can I prevent an incorrect value being measured and output due to the shape of the	If the incorrect measurement is caused by multireflection due to the shape of the	Double Sheet Detection	
workpiece?	workpiece, setting the detection surface selection to MAX might improve the	Thickness	
Does the sensor need to be warmed up after canceling LD-OFF input?	measurement accuracy. (See page 120.) Yes. The sensor must be warmed up for at least 10 minutes in the same way as when	Positioning	
Can the sensor head of a diffuse-reflective	turning on the power.	Eccentricity and Surface Deflection	
model be tilted like that of a regular-reflective model?	Yes it can, but because the sensor is tilted, the actual measurement distance between the sensor and the workpiece will differ from the distance displayed.	DETAILED	
	In this case, use a regular-reflective model whose linearity has been optimized by using regular-reflective optics.	TROUBLE- SHOOTING	

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Specifications and Dimensions

Amplifier Units CONTENTS ZX2-LDA11/LDA41 INTRODUCTION (Unit: mm) PREPARATION FOR MEASUREMENT 11.7 8 E FLOW OF OPERATION Vinvl insulated round cable 5.2 dia., 11 conductors (Conductor cross-section 0.09 mm²/ Insulator diameter: 0.7 mm) Note: The analog output line (black) BASIC has double shielding and SETUP 72 (cover open, 84.6) 6.2 the diameter of the insulator is 2.3 mm 30 Standard length: 2 m Minimum bending radius: 30 mm 47.6 4.2 MAIN APPLICATIONS & SETTING METHODS в 9.6 56) 6 38.4 (cover open, 5 Height 34.2 16.6 Steps and 16.9 Warpage ₹-Double 20.7 36.8 Sheet 10.9 15.4 6.1 Detection * Min. length when connected: 50 Thickness

50 mm

E

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Model Item	ZX2-LDA11	ZX2-LDA41		
Measurement period (*1)	Min. 30 µs			
Response time	60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms			
Analog output (*3)	4 to 20 mA, Max. load resistance: 300 Ω , ±5 Output impedance: 100 Ω	VDC or 1 to 5 VDC,	INTRODUCTI	
Judgment outputs (HIGH/PASS/ LOW: 3 outputs), error output	NPN open-collector outputs, 30 VDC, 50 mA max. fesidual voltage: 1 V max. for load current 10 mA max., 2 V max. for load current	PNP open-collector outputs, 30 VDC, 50 mA max. residual voltage: 1 V max. for load current 10 mA max., 2 V max. for load current	PREPARATIO FOR MEASUREME FLOW OF	
Laser OFF input, zero reset input, timing input, reset input, bank input (*2)	 Above 10 mA ON: Short-circuited with 0-V terminal or 1.2 V or less. OFF: Open (leakage current: 0.1 mA max.) 	C above 10 mA J ON: Supply voltage short-circuited or supply voltage within –1.2 V OFF: Open (leakage current: 0.1 mA max.)	BASIC SETUP	
Functions	Smart tuning, scaling, sample hold, peak hold, bottom hold, peak-to-peak hold, self-peak hold, self-bottom hold, average hold, zero reset, On-delay timer, OFF-delay timer, keep/clamp switch, (A-B) calculations (*4), thickness calculation (*4), mutual interference prevention (*2)(*4), laser deterioration detection, bank function (4 banks), differential function			
Indications	Judgement indicators: HIGH (orange), PASS (green), LOW (orange),11-segment main display (red), 11-segment sub-display (orange), laser ON (green), zero reset (green), ENABLE (green), MENU (green), HIGH threshold (orange), LOW threshold (orange)			
Power supply voltage	10 to 30 VDC, including 10% ripple(p-p)			
Power consumption	3,000 mW max. (at 24 VDC: 125 mA max., at 12 VDC: 250 mA max.)			
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)			
Dielectric strength Vibration resistance (destruction)	1,000 VAC, 50/60 Hz for 1 minute 10 to 150 Hz, 0.7-mm double amplitude, 80 minutes each in X, Y, and Z directions			
Shock resistance (destruction)	300 m/s ² 3 times each in six directions (up/down, left/right, forward/backward)			
Degree of protection	IEC60529, IP40			
Connection method	Prewired (standard cable length: 2 m)			
Weight (packed state)	Approx. 200 g (main unit only: approx. 135 g)			
Materials	Case: PBT (polybutylene terephthalate), Cover: Polycarbonate, Display: Acrylic resin, Buttons: Polyacetal, Cable: PVC			
Accessories	Instruction sheet		CATION	

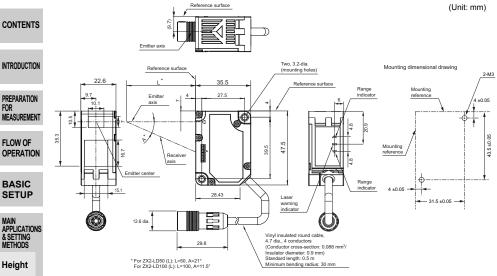
(*2) External input and the mutual interference prevention function cannot be used at the same time.

(*3) In the MENU mode, select and set current output (4 to 20 mA) and voltage output (±5 V or 1 to 5 V).

(*4) A Calculating Unit (ZX2-CAL) is required. Mutual interference prevention is possible for up to five Amplifier Units, and calculations are possible for up to two.

Sensor Heads

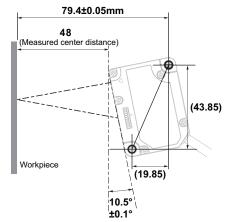
ZX2-LD50/LD50L, ZX2-LD100/LD100L, ZX2-LD50V



Setting Up the Regular-reflective Model

Tilt the regular-reflective model as shown below with respect to the workpiece. See page 141 if attaching a bracket to tilt the regular-reflective model.

ZX2-LD50V



Adjust the installation so that the angle is 10.5° ±0.1°. *The mounting hole dimensions in parentheses (reference values) are for when the Sensor is installed at 10.5°.

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Model Item	ZX2-LD50L	ZX2-LD50	ZX2-LD100L	ZX2-LD100	
Optical system	Diffuse-reflective	Diffuse-reflective			
Light source	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 1 mW max.				
(wave length)	EN class 2, FDA class	2 (*5)			CONTENTS
Measurement center distance	50 mm		100 mm		
Measurement range	±10 mm		±35 mm		INTRODUCTION
Beam shape	Line	Spot	Line	Spot	
Beam size (*1)	Approx. 60 µm x 2.6 mm	Approx. 60 µm dia.	Approx. 110 µm x 2.7 mm	Approx. 110 µm dia.	PREPARATION FOR
Resolution (*2)	1.5 µm	•	5 µm		MEASUREMENT
Linearity (*3)	±0.05% F.S. (40 to 50 mm)	±0.1% F.S. (40 to 50 mm)	±0.05% F.S. (65 to 100 mm)	±0.1% F.S. (65 to 100 mm)	FLOW OF
	±0.1% F.S. (entire range)	±0.15% F.S. (entire range)	±0.1% F.S. (entire range)	±0.15% F.S. (entire range)	OPERATION
Temperature characteristic (*4)	0.02% F.S./°C				BASIC SETUP
Ambient illumination	Incandescent lamp: 10,000 lx max. (on light receiving side)				MAIN
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)				APPLICATIONS & SETTING METHODS
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)				Height
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute				
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes each in X, Y, and Z directions				Steps and Warpage
Shock resistance (destruction)	300 m/s ² 3 times each in six directions (up/down, left/right, forward/backward)				Double
Degree of protection	IEC60529, IP67				Detection
Connection method	Connector connection (standard cable length: 500 mm)				Thickness
Weight (packed state)	Approx. 160 g (main unit only: approx. 75 g)				Positioning
Materials	Case and cover: Polybutylene terephthalate, Optical window: Glass, Screw sections: Brass, Cable: PVC				Eccentricity
Accessories	Instruction sheet, ferrite core x 1 (made by TDK Corp. ZCAT1730-0730A), laser warning label (English), FDA certification label				and Surface Deflection

(Note) Highly reflective objects can result in incorrect detection by causing out-of-range measurements.

(*1) Beam size: The beam size is defined by 1/e² (13.5%) of the strength of the beam at the beam center (measured value).
 Incorrect detection may occur if there is light leakage outside the defined spot and the material around

 the sensing object is more reflective than the sensing object.
 (*2) Resolution: The resolution is the deviation (±3\circ) in the analog output when connected to the ZX2-LDA Amplifier Unit. (The resolution is measured with the standard reference object (white ceramic), at the measurement point when the response time of the ZX2-LDA is set to 128 ms.) The resolution is given at the repeat accuracy for a stationary workpiece, and is not an indication of the distance accuracy. The resolution may be adversely affected under strong electromagnetic fields.

The resolution may be adversely affected under strong electromagnetic fields. (*3) Linearity: The linearity is given as the error in an ideal straight line displacement output when measuring

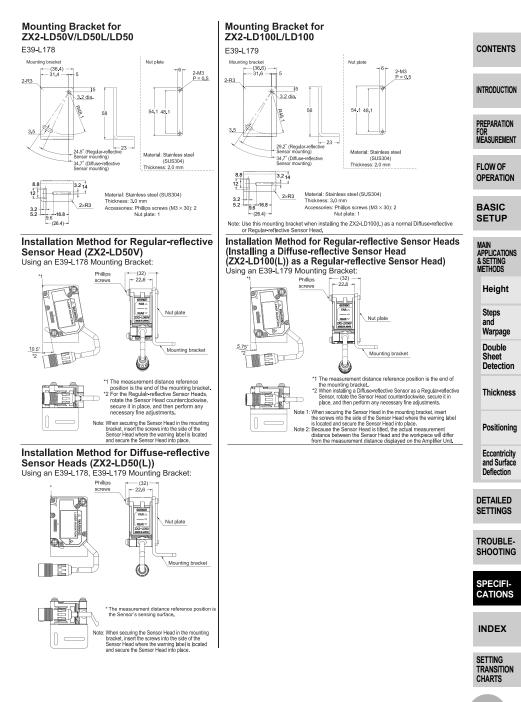
- (3) Linearity. The linearity is given as the error in an ideal straight line displacement output when measuring the standard reference object. The linearity and measurement values vary with the object being measured. F.S. is the entire measurement range. (ZX2-LD50D:20mm)
- (*4) Temperature characteristic: The temperature characteristic is measured at the measurement center distance with the Sensor and reference object (OMRON's standard reference object) secured with an aluminum jig.
- (*5) Categorized as Class 2 by IEC60825-1 criteria in accordance with the stipulations of the FDA standard Laser Notice No. 50, and registered with CDRH (Center for Devices and Radiological Health) (accession number: 1020665)

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	Model Item	ZX2-LD50V		
	Optical system	Regular-reflective		
CONTENTS	Light source (wave length)	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 0.24 mW max.		
		EN class 1, FDA class 1 (*5)		
INTRODUCTION	Measurement center distance	48 mm		
PREPARATION	Measurement range	±5 mm		
FOR MEASUREMENT	Beam shape	Spot		
	Beam size (*1)	Approx. 60 µm		
FLOW OF	Resolution (*2)	1.5 μm		
OPERATION	Linearity (*3)	±0.3% F.S. (entire range)		
BASIC	Temperature characteristic (*4)	0.06% F.S./°C		
SETUP	Ambient illumination	Incandescent lamp: 10,000 lx max. (on light receiving side)		
MAIN APPLICATIONS & SETTING	Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)		
METHODS	Ambient humidity	Operating and storage: 35% to 85% (with no condensation)		
Height	Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute		
Steps and	Vibration 10 to 150 Hz, 0.7-mm double amplitude, 80 minutes each in X, Y, and Z directions (destruction)			
Warpage Double	Shock resistance (destruction)	300 m/s ² 3 times each in six directions (up/down, left/right, forward/backward)		
Sheet Detection	Degree of protection	IEC60529, IP67		
Thickness	Connection method	Connector connection (standard cable length: 500 mm)		
	Weight (packed state)	Approx. 160 g (main unit only: approx. 75 g)		
Positioning	Materials	Case and cover: Polybutylene terephthalate, Optical window: Glass, Screw sections: Brass, Cable: PVC		
Eccentricity and Surface Deflection	Accessories	Instruction sheet, ferrite core \times 1 (made by TDK Corp. ZCAT1730-0730A), laser warning label (English), FDA certification label		
DETAILED SETTINGS	(*1) Beam size: (measured)			
TROUBLE-	the sensing	tection may occur if there is light leakage outside the defined spot and the material around object is more reflective than the sensing object. The resolution is the deviation ($\pm 3\sigma$) in the analog output when connected to the ZX2-LDA		
SHOOTING	Amplifier Ur measureme	nit. (The resolution is measured with the standard reference object (1/4 λ flat mirror), at the ent point when the response time of the ZX2-LDA is set to 128 ms.) ion is given at the repeat accuracy for a stationary workpiece, and is not an indication of the		
SPECIFI- CATIONS	distance ac The resoluti	curacy. ion may be adversely affected under strong electromagnetic fields.		
INDEX	the standard The linearit	he linearity is given as the error in an ideal straight line displacement output when measuring d reference object. Ity and measurement values vary with the object being measured. F.S. is the entire		
INDEX		e characteristic: The temperature characteristic is measured at the measurement center distance		
SETTING TRANSITION CHARTS	(*5) Categorized	Isor and reference object (OMRON's standard reference object) secured with an aluminum jig. as Class 1 by IEC60825-1 criteria in accordance with the stipulations of the FDA standard e No. 50, and registered with CDRH (Center for Devices and Radiological Health) (accession 20665)		
140	Specificatio	ns and Dimensions ZX2 User's Manual		

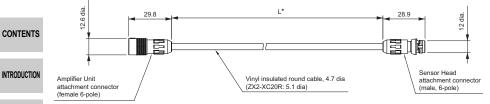
Mounting Bracket



Sensor Head Extension Cables

ZX2-XC1R, ZX2-XC4R, ZX2-XC9R, ZX2-XC20R

(Unit: mm)



PREPARATION FOR MEASUREMENT

*L Cable lengths: ZX2-XC1R: 1 m, ZX2-XC4R: 4 m, ZX2-XC9R: 9 m, ZX2-XC20R: 20 m

Note. Two or more extension cables cannot be connected in series.

FLOW OF OPERATION	Model Item	ZX2-XC1R	ZX2-XC4R	ZX2-XC9R	ZX2-XC20R	
	Cable type	Flex-resistance type				
	Degree of protection	IP67				
BASIC SETUP	Dielectric strength (connector)	No flashover and no breakdown at AC 300 V for 1 minute				
	Insulation resistance (connector)	1000 MΩ min. (at 100 VDC)				
MAIN	Weight (packed state)	Approx. 70 g	Approx. 450 g	Approx. 600 g	Approx. 1050 g	
APPLICATIONS & SETTING METHODS	Materials	Connector: PPS and PBT, Cable: PVC				
	Minimum bend radius	30 mm				
Height	Accessories	Ferrite core x 2 (made by TDK Corp. ZCAT1730-0730A)				

Steps and Warpage

Height

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

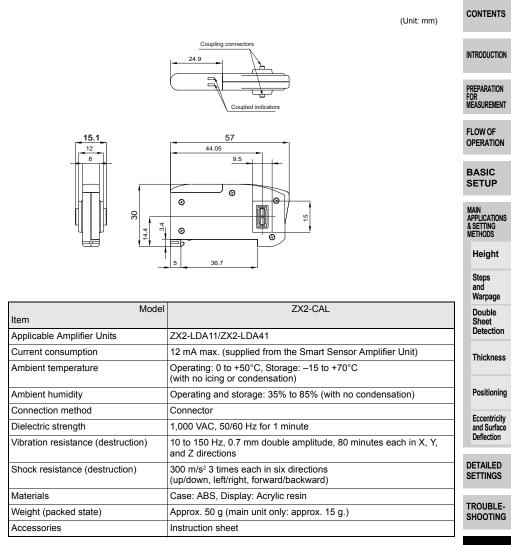
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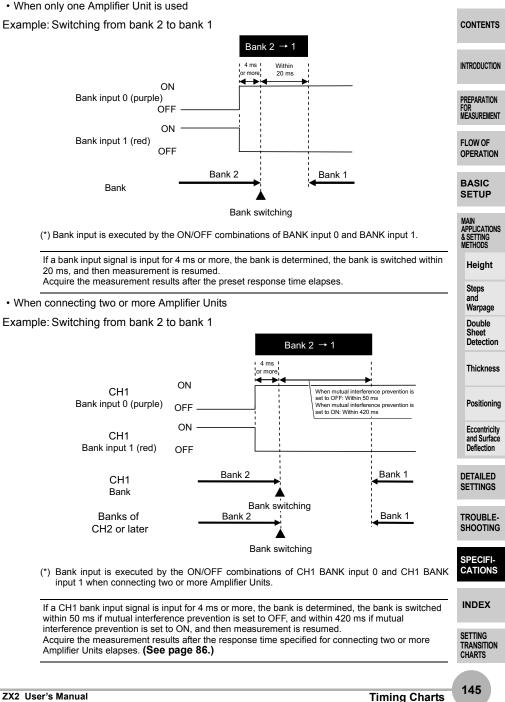
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This section explains the timing charts for the I/O signals that are exchanged between the Controller and external devices.

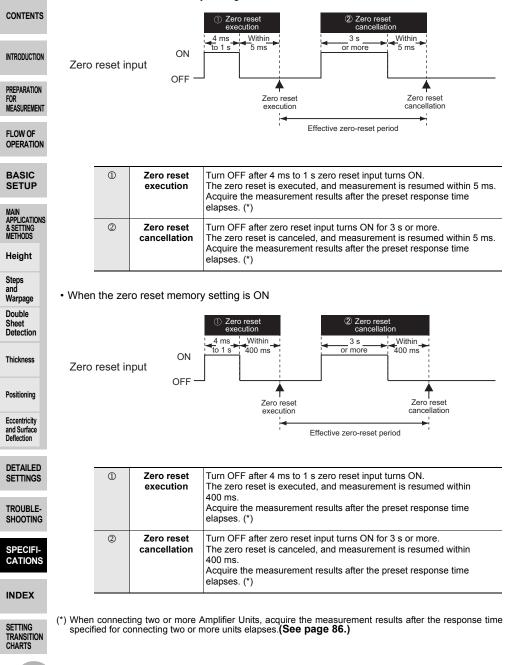
Laser OFF input INTRODUCTION Laser emission ON→OFF (2) Laser emission OFF→ON PREPARATION 4 ms____ Within 4 ms Within FOR 8 ms (*) 20 ms (*) MEASUREMENT or more or more ON Laser OFF input FLOW OF OFF OPERATION ON BASIC Laser emission SETUP OFF MAIN APPLICATIONS Laser emission 1 If laser OFF input is ON for 4 ms or more, the signal is received, and & SETTING $ON \rightarrow OFF$ laser emission is turned OFF within 8 ms. METHODS 2 Laser emission If laser OFF input is OFF for 4 ms or more, the signal is received, and Heiaht $OFF \rightarrow ON$ laser emission is turned ON within 20 ms. Steps (*) The value is within 150 ms when mutual interference prevention is set to ON. and Warpage Reset input Double Sheet Detection ② Output value Output value reset cancellation reset execution 4 ms Within or more 4 ms (*1) Thickness 4 ms or more ON Reset input Positioning OFF Eccentricity and Surface Deflection Effective reset period DETAILED SETTINGS 1 Output value If reset input is ON for 4 ms or more, the signal is received, and output reset execution is reset within 4 ms. TROUBLE-2 Output value If reset input is OFF for 4 ms or more, measurement is resumed. SHOOTING reset Acquire the measurement results after the preset response time cancellation elapses. (*2) SPECIFI-(*1) The value is within 150 ms when mutual interference prevention is set to ON. CATIONS (*2) When connecting two or more Amplifier Units, acquire the measurement results after the response time specified for connecting two or more units elapses. (See page 86.) Note. • When the hold function is not used INDEX The output while a reset signal is being input is held in accordance with the output during nonmeasurement setting. When the hold function is used SETTING If a reset signal is input, the state in effect before the hold function was set will be restored. TRANSITION (For details on the hold function, see page 93, and for details on the output during CHARTS non-measurement, see page 111.) 144 ZX2 User's Manual Timing Charts

Bank input



Zero reset input

· When the zero reset memory setting is OFF

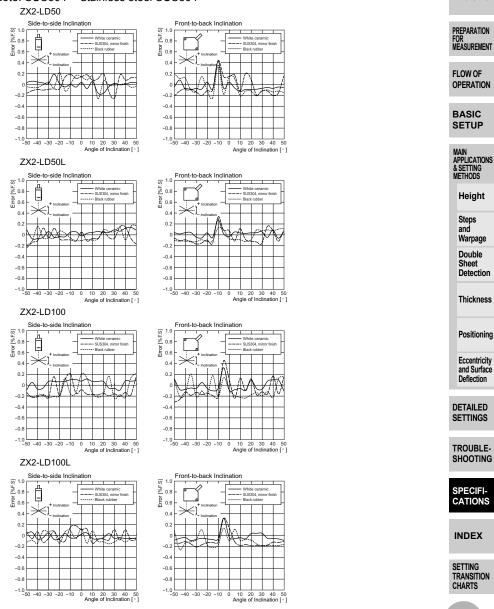


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Engineering Data (Reference Value)

Angle Characteristic

The angle characteristic is a plot of the inclination of the sensing object in the measurement range and the maximum value of the error to analog output. Note: SUS304 = Stainless steel SUS304



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-4

-- FAR side -- 4

nent (mm

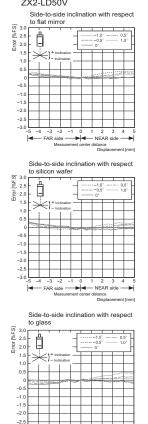
NEAR side

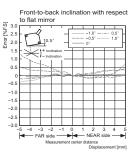
Measurement center distance Displace

and

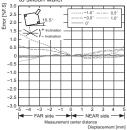
OPERATION

FOR

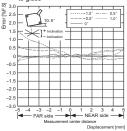




Front-to-back inclination with respect to silicon wafer

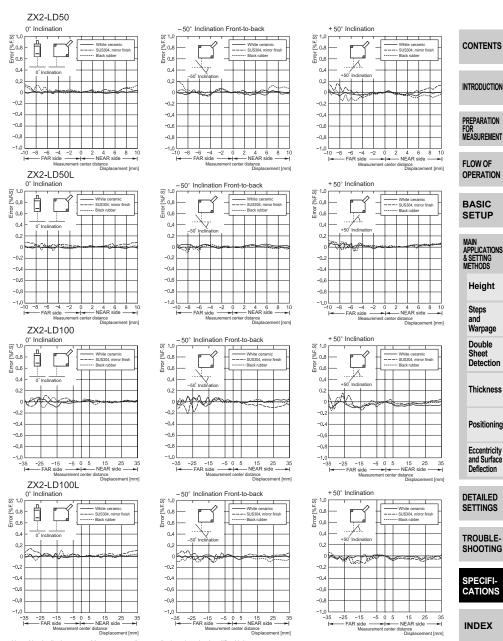


Front-to-back inclination with respect to glass





Linearity Characteristic for Different Materials



Note. X axis displacement: Measurement distance displayed on the Amplifier Unit For the measurement distance displayed on the Amplifier Unit, the measurement center distance is displayed as 0, and the NEAR and FAR sides from the sensor are displayed by + and -, respectively.

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TRANSITION CHARTS

Linearity Characteristic for Different Materials

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ZX2-LD50V 0° Inclination

[S: 1.0 [S: 4]% 0.8

0.6

0.4 0.2

0 -0.2 -0.4

-0.6

-0.8

-10

н - FAR side ·

-4 -2 -1

Beam Size

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

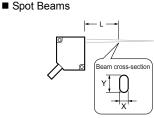
MAIN APPLICATIONS & SETTING METHODS

Height

Steps and

Warpage Double Sheet Detection

Thickness



Flat mirro

Glas

- NEAR side -

side ______ Measurement center distance Displacement [mm]

-

Silicon wafe

ZX2-LD50

L	+10 mm	0 mm	-4 mm	–10 mm
х	Approx. 600 µm	Approx. 160 µm	Approx. 40 µm	Approx. 220 µm
Y	Approx. 350 µm	Approx. 90 µm	Approx. 60 µm	Approx. 130 µm

ZX2-LD100

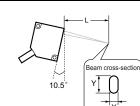
Positioning	L	+35 mm	0 mm	–20 mm	–35 mm
	х	Approx. 1.1 mm	Approx. 400 µm	Approx. 70 µm	Approx. 250 µm
Eccentricity and Surface Deflection	Y	Approx. 550 µm	Approx. 190 µm	Approx. 110 µm	Approx. 150 µm

DETAILED SETTINGS

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CATIONS ZX2-LD50V

L	+5 mm	0 mm	-4.2 mm	–5 mm
Х	Approx. 350 µm	Approx. 160 µm	Approx. 40 µm	Approx. 50 µm
Y	Approx. 180 µm	Approx. 90 µm	Approx. 60 µm	Approx. 70 µm

SETTING TRANSITION CHARTS

–5 mm		
Approx. 50 µm	Note. L:	Measureme Amplifier
Approx.		distance di

ent distance displayed on the Unit (For the measurement isplayed on the Amplifier Unit, urement center distance is displayed as 0, and the NEAR and FAR sides from the sensor are displayed by + and -, respectively.)

Line Beams

Note. X axis displacement: Measurement distance displayed on

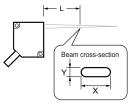
the measurement center distance is displayed as 0,

For the measurement distance displayed on the Amplifier Unit,

and the NEAR and FAR sides from the sensor are displayed by

the Amplifier Unit

+ and -, respectively.



7X2-I D501

L	+10 mm	0 mm	-4 mm	–10 mm
Х	Approx. 2.6 mm	Approx. 2.6 mm	Approx. 2.6 mm	Approx. 2.6 mm
Y	Approx. 350 µm	Approx. 90 µm	Approx. 60 µm	Approx. 130 µm

ZX2-LD100L

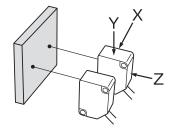
L	+35 mm	0 mm	–20 mm	–35 mm
Х	Approx. 2.1 mm	Approx. 2.5 mm	Approx. 2.7 mm	Approx. 2.9 mm
Y	Approx. 550 µm	Approx. 190 µm	Approx. 110 µm	Approx. 150 µm

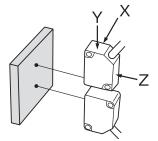
Reference: Distance between two diffusereflective models that causes malfunction when mutual interference prevention is turned off

The distance at which the resolution exceeded the rated value when sensors were moved towards each other (in all the X, Y, and Z directions) while mutual interference prevention was turned off was measured. (Workpiece: white ceramic; positioned facing the sensor, not on an angle.)

Horizontal direction

Vertical direction





Results: For all models, the distance that causes malfunction is 0 mm in all the X, Y, and Z directions.

Note. The above result was obtained when the white ceramic workpiece was positioned facing the sensor, not on an angle.

Note that mutual interference can occur when using different types of workpieces or when the sensors are attached at an angle, so it is recommended to use the sensors with mutual interference prevention turned on.

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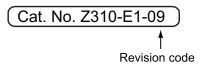
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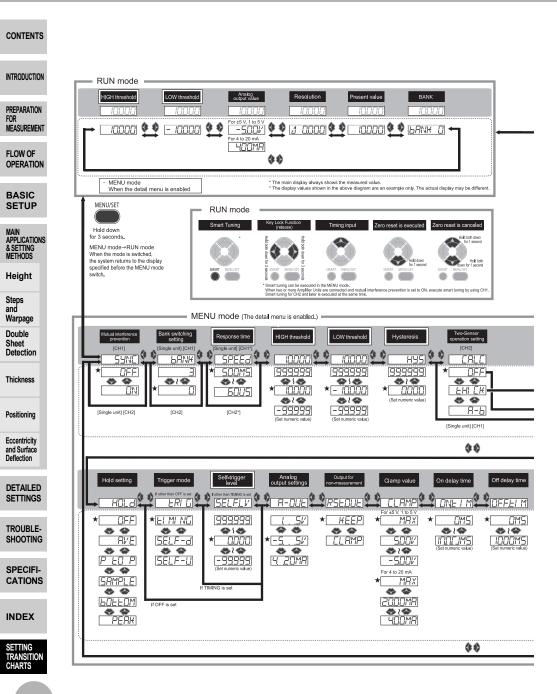
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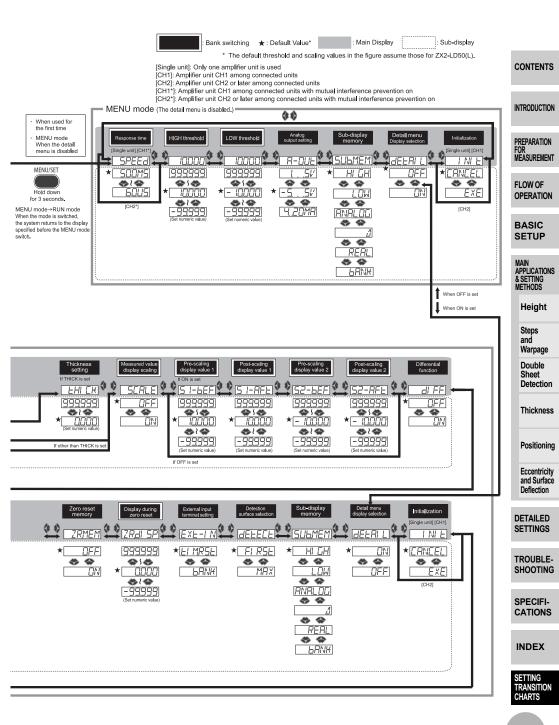
A manual revision code appears as a suffix to the catalog number at the bottom of the front and back covers of this manual.



Revision code	Date	Revised contents
01	Oct. 2010	Original production
02	Jan. 2011	General revision (calculating unit launched)
03	Apr. 2011	General revision (differential function and detection surface selection function added)
04	Jul. 2011	Revision (regular-reflective model launched)
05	Dec. 2011	Minor corrections
06	Nov. 2013	Pages 5 to 7: Updated terms and conditions agreement. Page 10: Changed information on FDA standards. Page 137: Changed specification of power consumption. Page 138: Changed L and A values for ZX2-LD100 (L). Page 139: Changed information on FDA standards. Page 140: Changed information on FDA standards and changed specification of accessories. Page 141: Revised dimensions of E39-L178/L179 Mounting Brackets. Page 147: Changed "Typical" to "Reference Value."
07	Mar. 2015	Pages 26 and 86: Corrected channel designations for formula in figure. Page 50: Added sentence at top right of page. Page 136: Added callouts to figure. Page 138: Changed figure at bottom of page. Pages 139 and 140: Added material for screw sections.
08	July 2015	Page 11: Added applicable standards. Corrected mistakes.
09	November 2018	Page 6: Updated terms and conditions agreement. Page 90, 119 and 137: Added notes on mutual interference prevention.

SETTING TRANSITION CHARTS





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Cat. No. Z310-E1-09